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Contents—January 10, 1935

The Outlook for Durable Goods 9
Metal-Working Costs Under New Deal 10
The Iron Age of Dura Craftsmanship 13
Competition for Markets Spurred Metallurgical Activity .. 16
The Year's Progress in Metal Finishing 24
Application of Wear-Resistant Alloys to Mill Equipment .. 30
Coating Machine Elements by Metal Spraying 35
New Equipment 38
News 44
Personals and Obituaries 47
Wahington News 48
December Pig Iron Production 53
Automotive Industry 54
Markets 57
Construction and Equipment Buying 76
Products Advertised 90
Index to Advertisers 108

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JANUARY 10, 1935

ESTABLISHED 1855 Vol. 135, No. 2

Outlook for Capital Goods

THE reservoirs of delayed demand for capital goods, swollen to the bursting point by four years of abnormal obsolescence and abstinence, are about ready to overflow. If there is any doubt in your mind, consider the $100,000,000 which steel makers alone are preparing to spend for plant rehabilitation.

Consider too, that Mr. Ford, who sets the pace for the automobile industry, has announced a capital goods buying program, for plant and machinery that will run to $26,000,000.

These are but two isolated cases which are typical of the promised tempo of American industry at large. Production has been marking time for such a long period in its old shoes that there are holes in the bottoms. It realizes that it cannot run the race that is coming without a new pair or at least a thorough half soling job.

Why are the steel makers and Mr. Ford and many others getting ready to spend these huge sums? Surely not to increase their plant capacity, for except in rare cases, present capacities well exceed future prospects for business. These expenditures will be made almost wholly to increase operating efficiency and to insure profits on the going volume of business.

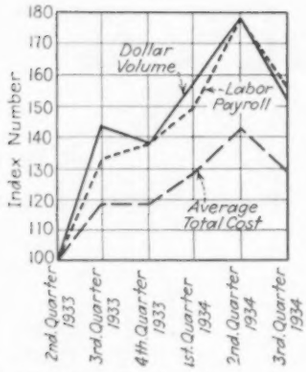
The steel makers and Mr. Ford have the money in hand, or at least a large part of it, with which to do the job that they have planned. Many other concerns, with smaller resources, that must follow suit in order to keep up with the new tempo must depend upon private investors for the wherewithal. These private investors, most of whom already have an investment stake in industry, will protect their positions and incomes by furnishing additional capital to improve operating procedures. Private capital in individual hands always follows the definite trend of influential corporate capital.

Thus the stage of events is getting set for the bursting of the dam of delayed demand for capital goods, which, when it happens will sweep away the excess margin of unemployment in the heavy industries, and which will safeguard the public treasury by transferring huge payroll obligations from public to private shoulders.

There is a darker side, however, to this bright picture. If professional labor disturbers are permitted to carry out their present threat of tying up the steel, the automotive and other industries in the name of collective bludgeoning, the dam of delayed demand will **not** overflow. The rising waters of investment confidence will subside overnight and it will take months to raise them again to present levels.

It is unthinkable that the Administration or the American public would permit such an eventuality.

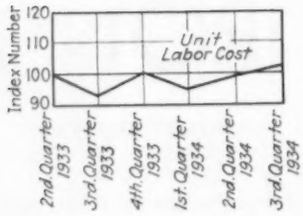
A



PAYROLLS, Dollar Volumes and Average Total Costs per Unit of Sales Dollar Volume as Averaged for All 111 Reporting Concerns (Second quarter of 1933 = 100)

Here is the "overall" picture. Compared with the position at the "starting point," at the end of the third quarter of 1934, volumes were up 52 per cent, payrolls for labor 55 per cent and average total costs, (materials, labor and overhead) had increased 28 per cent. Normally, of course, a 52 per cent increase in volume would have materially decreased average unit cost per dollar of sales, bringing it down below the initial index of 100. Wage and price increases due to NIRA may therefore conservatively be said to have added not less than 30 per cent to average costs in the metal-working industry.

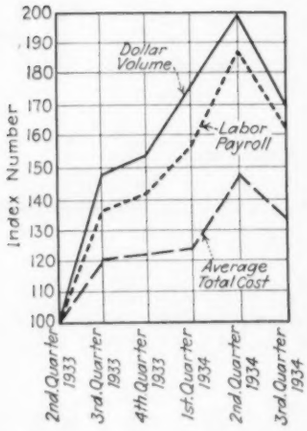
B



DIRECT Labor Cost, per Unit of Sales Volume, as Averaged for all 111 Concerns (Second quarter of 1933 = 100)

This is another "overall" picture, which reflects considerable credit upon managerial efficiency in the metal-working industry. Despite the increases in wage rates which have taken place throughout the industry, direct labor costs per dollar of sales until the third quarter of last year have been kept well in hand. Improvement in mechanization has been partly responsible, though increases in selling prices have undoubtedly done their share.

C



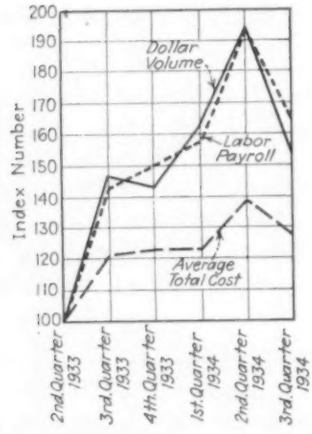
PAYROLLS, Dollar Volumes and Average Total Costs per Unit of Sales Dollar Volume as Averaged in 70 Concerns Producing Durable Goods

Here is a cost and volume picture in the much discussed "durable" goods industry. At the end of the third quarter of 1934 we find average total costs up 34 per cent as compared with the second quarter of 1933, dollar volume 69 per cent up and labor payroll 62 per cent up. In this division, there is more spread between the labor payroll index and the dollar volume index than there was for the metal-working industry's collective record shown on the first chart.

Metal-Working Costs

HOW has the metal-working industry fared under the New Deal? To this question there has been no lack of answers. Most of them, however, have been based upon opinion or individual experience. There has, up to now, however, been no definite factual answer. The survey which has been completed by The Iron Age, is a factual answer, for it is based upon the operating record, by quarters, of 111 concerns of wide diversification in the metal-working industry.

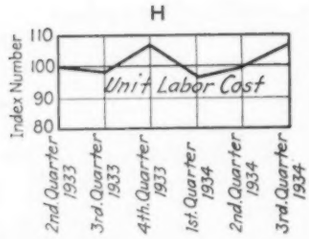
G



PAYROLLS, Dollar Volumes and Average Total Costs per Unit of Sales Volume as Averaged for 54 Concerns Employing More than 100 Men Each

Here is what we might call the "large plant" picture. It should be viewed in comparison with Chart I, which represents the experience of plants employing 100 or less. Note that the dollar volume increases in the two cases are the same, 52 per cent, represented by the third quarter of 1934. But in the case of the large concerns, average costs are up 31 per cent as compared to 25 per cent in the small. It does not look as though the New Deal had discriminated against the small units in our field. But perhaps small plant managers have to be smarter than those in large ones.

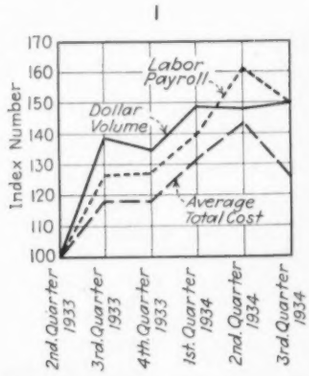
H



DIRECT Labor Cost, per Unit of Sales Volume as Averaged for 54 Concerns Employing More than 100 Men Each

Labor cost control in our large plants has evidently been a game of "nip and tuck" with the last accent on the nip. Comparing this chart with Chart J, which shows the labor cost experience of the small plants, we would say that the latter have the best of it so far.

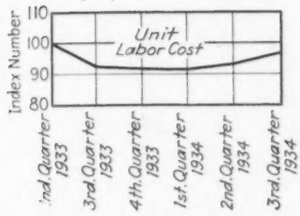
I



PAYROLLS, Dollar Volumes and Average Total Costs per Unit of Sales Volume as Averaged for 57 Concerns Employing Less than 100 Men Each

Here is the small plant picture. The chief feature of it is the relation of payroll to dollar volume. Compare this relationship with that in Chart G, representing the larger plants. If our large plants had had this same spread, they would have shown larger profits.

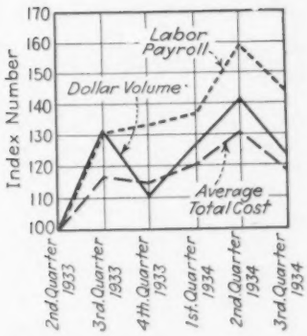
D



DIRECT Labor Cost, per Unit of Sales Volume as Averaged in 70 Concerns Producing Durable Goods

Management, in the durable goods industry seems to have "held the line" better than management in those plants which make consumer goods of metal. For it is evident that unit labor costs, measured on dollar volume, have not been permitted to cross the goal line.

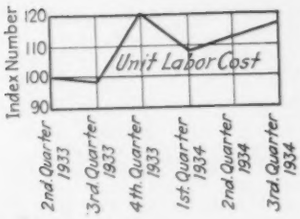
E



PAYROLLS, Dollar Volumes and Average Total Costs per Unit of Sales Volume as Averaged for 41 Concerns in the Metal-Working Industry making Consumer Goods

Here we have a quite different picture. Note that the labor payroll after the third quarter of 1933 has consistently climbed ahead of dollar volume. Also note that dollar volume, in the last quarter recorded is up but 23 per cent over the pre-NRA base, as contrasted with the 69 per cent increase in the durable goods division. This is largely explainable on the basis that "the lower down you are, the farther you have to climb to get back."

F



DIRECT Labor Cost, per Unit of Sales Volume, as Averaged for 41 Concerns Making Metal Consumer Goods

Makers of metal consumer goods seem to be having a hard job to hold labor costs per dollar of sales in line. Note that the labor cost battle has gone against them since the third quarter of 1933. Perhaps they need to buy more mechanization from the makers of durable goods.

Under the New Deal

o o o

BY JOHN H. VAN DEVENTER

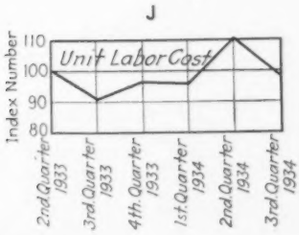
Editor, The Iron Age

o o o

The period included in our survey begins with the 2nd quarter of 1933, which was the quarter immediately preceding the inauguration of NIRA. It ends with the 3rd quarter of 1934, which was the latest 3 month period for which actual records were available. The data were compiled for us by the accounting departments of the contributing companies and represent performance figures, not estimates.

A Survey by The Iron Age, Presenting Results Based on the Performance of 111 Concerns

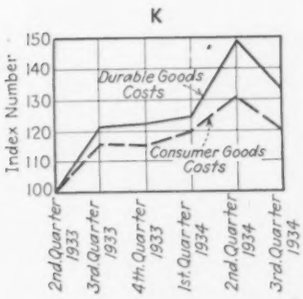
J



DIRECT Labor Cost, per Unit of Sales Volume, as Averaged for 57 Concerns Employing Less than 100 Men Each

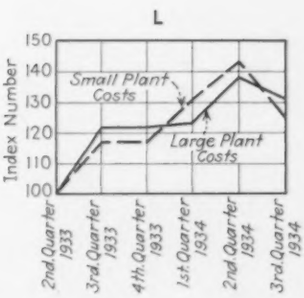
The small plant, in the metal-working industry at least, need not be ashamed of its record in controlling the controllable elements of cost. Under NRA, the cost of its materials are largely fixed. So also are its labor rates. Its one big "out" is what it does with the labor that it pays for. By and large, according to this record, it has done a good job.

K



COMPARISON of Manufacturing Costs, (Materials, Labor and Overhead), per Unit of Sales Dollars, in Durable Goods and Consumer Goods Plants.

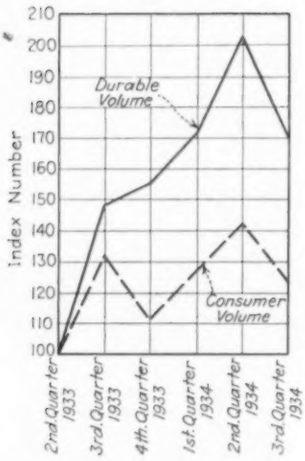
L



COMPARISON of Manufacturing Costs, (Materials, Labor and Overhead), per Unit of Sales Dollars, in Large and Small Metal-Working Plants.

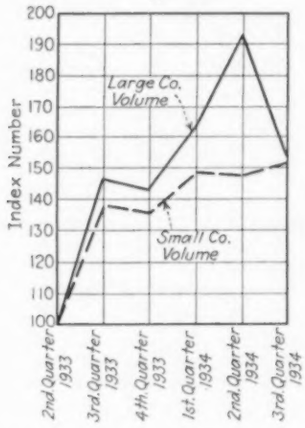
Metal-Working Costs Under the New Deal

M



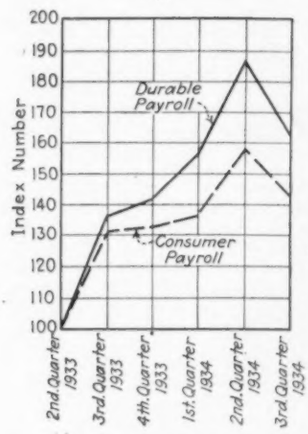
COMPARISON of Dollar Sales Volumes, by Quarters since NRA, in Plants Producing Durable and Consumer Goods.

N



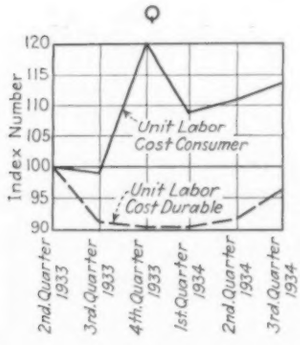
COMPARISON of Dollar Sales Volumes, by Quarters since NRA, of Large and Small Metal Working Companies.

O



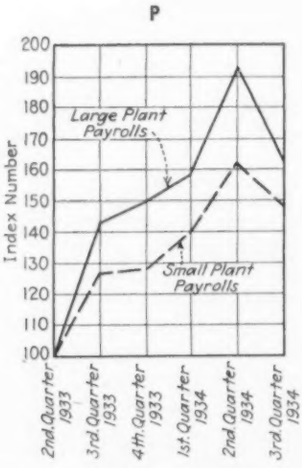
COMPARISON of Labor Payroll Trends, by Quarters Since NRA, in Durable and in Consumer Goods Plants in the Metal-Working Industry.

Q



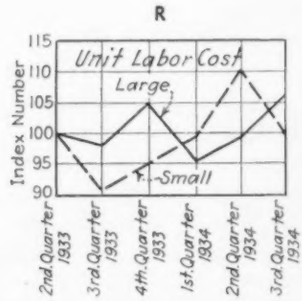
COMPARISON of Labor Unit Cost Control in Durable and in Consumer Goods Plants.

P



COMPARISON of Labor Payrolls in Large and Small Metal-Working Plants.

R



COMPARISON of Labor Unit Cost Control in Large and Small Metal-Working Plants.

German Barter Contracts Improve Steel Business

THE German steel and tube cartel has been successfully organized for barter and has already consummated contracts worth many millions of dollars. Among the most recent contracts is the exchange of 3670 tons of 6-in. steel tubing for the Sun Oil Co., Philadelphia, for which payment will be in oils. Another contract, probably the largest barter in modern history, calls for shipment of rails, locomotives, sleepers, machinery, etc., to South Africa. In exchange wool brokers there will ship around $12.5 million of wool to Germany. Another large contract was signed between Krupps, Oberhausen, and four other works and the Turkish Government, and has a value of $9.75 million dollars. Machinery and steel products will go from Germany in exchange for wool, cotton, fruits, ores, etc. Another contract has been signed with Manchoukuo for $4.5 million. Railway material, steel, etc., will be exchanged for soya beans, ores, etc. The German steel industry is prospering by these barter contracts, and operations are showing sizable advances each month.

The Iron Age of Dura Craftsmanship

By JOHN W. HIGGINS
President, Worcester Pressed Steel Co.

ALEXANDER THE GREAT, 250 years before Christ, allotted homesteads in Syria and Mesopotamia to three of his victorious generals. To Seleucus he assigned Dura-Europos, a stronghold on a high bluff of the Euphrates River, 100 miles east of Antioch and Damascus, strategically situated on the important caravan route from Beirut to Mesopotamia. Evidently this flourishing city was accessible to the Hittite ore mines and iron forges. The King of the Hittites seems to have originated our modern steel mill "Code of Fair Practice" in letter writing in 1400 B. C., when he dispatched this message to his impatient customer, Rameses II:

As to the good iron about which thou has written me: There is no good iron in my sealed house in Kissuwadna. It is a bad time to make iron, but I have written ordering them to make good iron. So far they have not finished it. When they finish it, I will send it to thee. Behold, now I am sending thee an iron dagger blade.

This is a translation of hieroglyphics on the clay tablet preserved in the Berlin State Museum.

For five centuries this Dura fortress was held by the Romans, when it was captured and destroyed by the Sassanians in 256 A. D. by a clever sapping tunnel that would have done credit to World War engineers. Evidently these ruins were then deserted and forgotten for 18 centuries, while the warm desert sands spread a dry protective mantle over the entire location. In 1922 a company of British soldiers digging trenches on the

NOW we must move the Iron Age calendar back some seven or eight hundred years. For the Fine Arts Expedition of Yale, excavating the site of Dura-Europos on the Euphrates River, has discovered remarkable archeological relics which prove that skilled craftsmanship in wrought iron dates back 1800 years, at least, from the present day. Heretofore, archeologists have ascribed such objects to the eighth century.

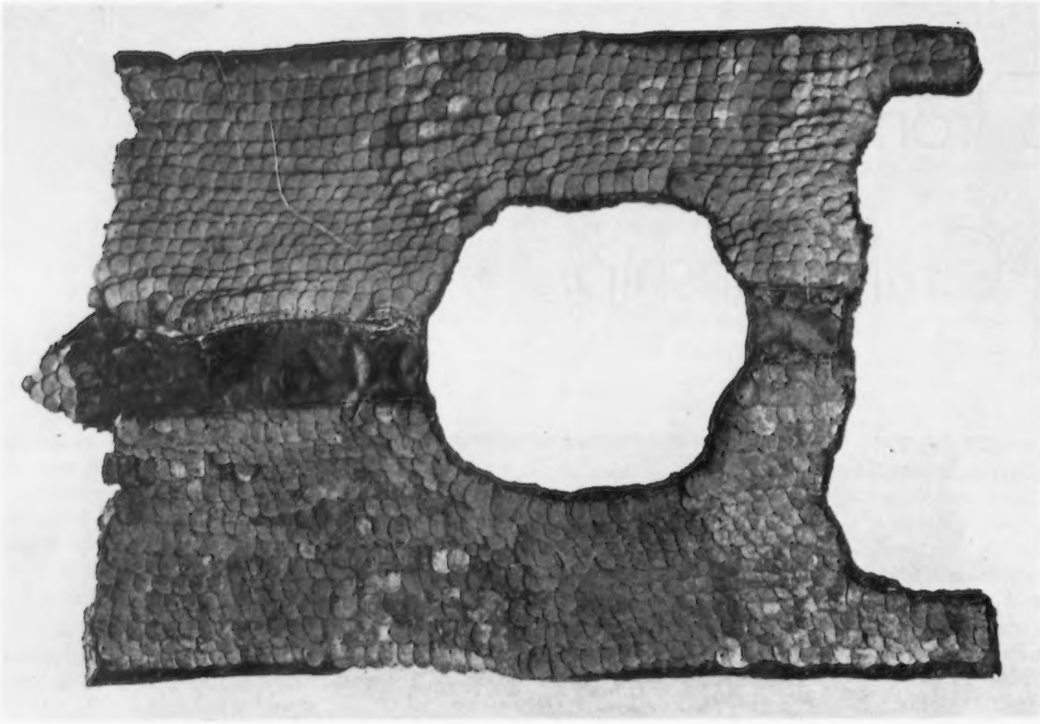
The astounding collection of Dura wrought iron objects described in this article by Mr. Higgins has been loaned for exhibition and study to the John Woodman Higgins Armory at Worcester.

* These photos, courtesy Gallery of Fine Arts, Yale University.

o o o

AN airplane view of Dura-Europos, where the Yale Fine Arts Expedition unearthed the remarkable examples of ancient wrought iron craftsmanship.*

o o o



FILE marks still show upon the wrought iron scales of the horse armor which dates back nearly to the beginning of the Christian era. Thanks to the dry desert atmosphere, the scales are free from rust and even the leather trimming is well preserved.

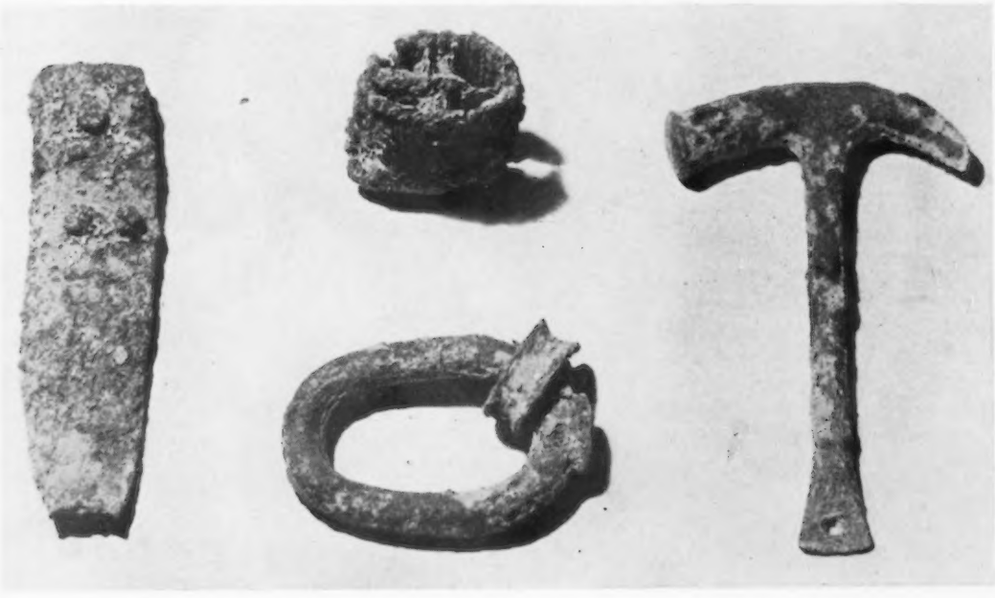
banks of the Euphrates River discovered the stone walls of a church beautifully decorated with Biblical scenes in typical early Christian art. This rather upset the long-faced ecclesiastical archeologists who had declared that early Christians never decorated their churches.

The Yale-French Academy Expedition

The Fine Arts Department of Yale University, cooperating with the French Academy of Science, organized an expedition, secured permission of the Syrian Government, and in 1929 started to dig. Today a gallery of the Yale Museum of Fine Arts is filled with marvelous mural frescoes, textiles, tablets, parchments, decorated cane shields and bronze implements of exquisite workmanship. These finds are perhaps the best authenticated and preserved archeological relics we have of the early Christian era.

This astounding collection of Dura wrought iron objects has been loaned for study and exhibition to the John Woodman Higgins Armory—an industrial museum of ancient and modern steel products of the Worcester Pressed Steel Company at Worcester, Mass.

Both the metal and the craft-technique as well as the designs of these 1800-year-old specimens favor the Middle Ages. Not until the sixteenth century when blast furnaces and rolling mills began producing "modern iron" in quantities have we found evidence of such abundance of this intractable metal applied to protective armament for horse as well as for man, to large spikes, swords, lamps, pipes, horseshoes and build-



NOTE the remarkable state of preservation of the welded iron link, the hammer and the cross-section of reinforced pipe.

ers' hardware. No earlier than the eighth century have such iron objects been ascribed by archeologists. Therefore, we must now reconstruct our concepts and resort to earlier contemporary documents like the bas-reliefs at Persepolis on the columns of Trajan and Marcus Aurelius, showing the Sarmatian warriors clothed in scale armor from head to foot—and on the Altar of Domitius Ahenobarfus. Now we should no longer surmise that these first century armors were mere leather and bronze. We shall assert that they were iron fish-scale mail like the brigandines illustrated on the Bayeux Tapestry of the eleventh century and like the fourteenth century iron specimens exhibited in armor museums. We shall marvel at the skill of the Sassanian blacksmiths rather than that of the Norman armorers. This Dura armor for the first time authenticates real war armor for the Roman captains. The Greeks may retain their Corinthian bronze swords as masterpieces of design, but this Roman iron armor was superior to bronze weapons. We must rewrite the first chapters of our histories of armor and craftmanship, as well as treatises on metallurgy.

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HERE are some of the Dura iron relics. Note the forged nails and spikes, the remarkable chain mail cuirass, of close riveted link mesh and the one piece "Quarrel heads."

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Early Craftsmen in Iron Working

It is true that iron furnaces and limonite mines existed in Halstatt in 800 B. C. and that long iron swords and heavy iron axe heads have been excavated from these Early Iron Age graves in Carniola in Upper Austria; but these objects are crude, sparse and in poor condition. We had the hieroglyphic references to Hittite iron mines and forges in 1400 B. C., and the Book of Genesis records that "Tubal Cain was an instructor of every artificer in brass and iron," perhaps 40 centuries before Christ. But our Dura blacksmiths forged their iron plates, swords, spear and quarrel heads with dexterity and confidence as well as knowledge of their metal, utilizing wrought iron anvils, good hardened hammers, swages, punches, shears, tongs, etc., besides charcoal fires, with forced air blasts and annealing muffles. This unique third century commercial hardware is equal in workmanship and design to familiar fifteenth century examples. We find welded rings, but have not yet discovered examples of case-hardening, tinning, brazing or soldering.

One Piece "Quarrel Heads"

These one-piece iron quarrel heads are forged with socketed shanks to receive their wood shafts. No effort was made to close or weld the seam in the sockets, but the split opening allowed the pointed wood shaft to be driven in securely without pinning. The square heads were accurately formed for service but the sockets were left roughly forged—an efficient commercial technique for war weapons to be used but once.

The perfectly preserved wood shafts of these short, heavy quarrels were roughly whittled and fitted with three leather "feathers," evidencing the use of crossbows which are supposed to have been first used in the eleventh century, replacing the early long bows for long arrows. Two iron quarrels had pierced holes through a bronze fish-scale plate armor. No crossbows or ballista were found for these quarrels. The graffito wall drawings illustrate curved long bows and arrows of the familiar type and a number of these long wood arrows were found. But no bows were found.

The iron plates of the horse armor are hammered uniformly thin, annealed soft with a slight blue scale, and no indication of burning, work-hardening, brittleness or laminating. The file marks still show on the face of the plates as though they were polished yesterday. Most of these plates are free from rust. Three horse panoplies were found, two of bronze plates and only one of iron plates. Fortunately this unique iron armor came to America. It comprises about 1400 overlapping plates (about 1¾ in. x 2¼ in. x 1/32 in. thick) punched with eight holes, fastened together in rows by wire staples, and sewed with rawhide thongs to a woven jute blanket (about 46 in. x 64 in.). These wire staples are iron or copper, used indiscriminately, and sheared or forged—not die drawn. This entire panoply is hemmed with soft tanned leather, including the circular hole for the saddle, with back strips and end flaps of heavy rawhide, still strong and in a remarkable state of preservation.

A few loose iron plates of similar shape were recovered, evidently belonging to a brigandine. These plates are larger (about 2 in. x 3 in.) and do not belong to our horse armor.

A Remarkable Chain Mail Cuirass

Here is a remarkable iron chain mail cuirass, now congealed into one solid mass but not deeply corroded, resembling a typical fifteenth century iron chain mail coat, of same

(CONCLUDED ON PAGE 75)

Vigorous

By T. W. LIPPERT
The Iron Age, New York

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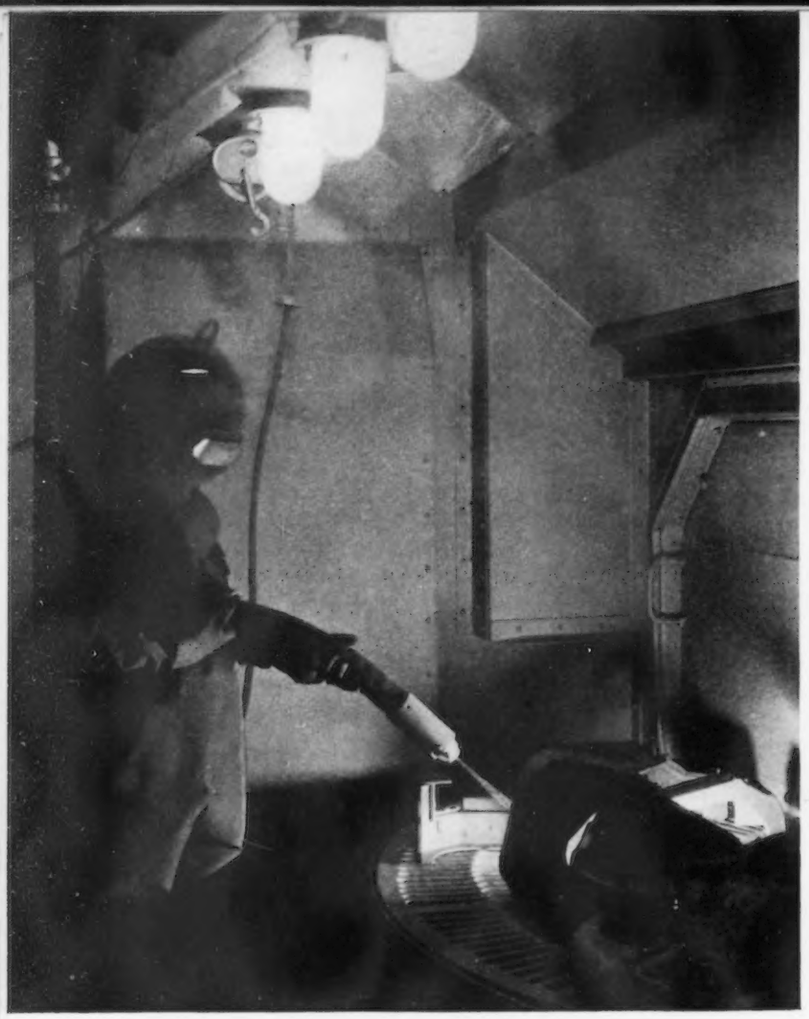

FIG. 3.—An outstanding metallurgical development of the year in use. The new boron carbide of the Norton Co. approaches the diamond in hardness, cuts cemented carbides, and is unaffected by the strongest acids and alkalies. Norbide is finding increasing favor as an abrasive and to resist abrasion. It can be molded into pressure blast nozzles and used for blasting, as shown here.

AT one time the metal industry was comparatively elementary. Each manufacturer offered a standard line of products designed to serve the demands of users who were only mildly concerned with characteristics such as strength, life expectancy, hardness, etc. In recent years, however, the problem of producing metals has evolved into something considerably more complex. Nowadays there are new alloys everywhere, hundreds of them embracing numerous combinations of common, rare, ferrous and non-ferrous metals. Likewise, on every hand there are new and better methods for the heat treatment, fabrication, and surface improvement of both the new alloys and the older metals.

In looking for the motivating forces which have created this age of alloys, one need only consider the rapid strides being made in railroad rolling stock and by automobile makers, the electrical industry and equipment builders, together with the many developments of smaller industries which are striving to satisfy the demands of the buying public. To retain his share of these markets, each maker of materials has been forced to meet diverse engineering specifications, and in some cases to anticipate future requirements and open up new outlets.

Naturally, this competitive pressure has caused research metallurgists to develop many materials and processes which overlap considerably, much to the confusion of users. And although each material seems to enjoy some degree of acceptance, its ultimate commercial status will be in direct proportion to the ease in which it meets certain physical requirements economically, or provides some special satisfaction such as beauty. Although 1934 was a prolific period for new processes and materials, no one development represented a totally new discovery, but really was the culmination of isolated or integrated researches which had usually extended over many years.

It has been in the transportation and construction fields that new materials have been particularly plentiful. A modern automobile may be constructed of 50 to 100 types of ferrous and non-ferrous alloys, and railroad equipment design is undergoing radical changes which point to the replacement of carbon steels by lighter ferrous and non-ferrous materials. Railroads are making these changes. In the passenger field the grimy and heavy locomotive is being eliminated and the passenger train is being transformed into a fleet, symmetrical and articulated unit. And to accomplish this materials must be employed which have a large strength-weight factor, good fabricating and welding properties and, in addition, a fair degree of corrosion resistance. Competition to supply materials meeting these requirements has already become keen, and makers of stainless steels, low-alloy high-tensile steels, castings and aluminum are all vying for the favor of railroad and equipment builders.

A group of low-alloy steels having good welding characteristics and corrosion resistance, all at a fairly low price, is being offered by the United States Steel Corpn. Among these steels are Cor-Ten, a low-chromium steel containing 0.50 to 1.50 per cent chromium, and Man-Ten, a medium manganese (1.25 to 1.70 per cent) steel with a copper content of 0.20 per cent minimum. Both of the materials machine and weld well, and have already been used to a consider-

Competition for New Markets Spurred Metallurgical Activity in 1934

able extent in the building of lightweight freight and passenger cars, as well as truck bodies.

An even more recent newcomer in this field is Republic Steel's new RDS alloy, which contains copper (1.50 per cent) and molybdenum (0.20 to 0.30 per cent), combined with a base metal having comparatively low carbon content. In the as-rolled condition the tensile strength varies from 75,000 to 100,000 lb. per sq. in. Like the USS alloys, this new material welds well, and the resistance to atmospheric corrosion is such as to adapt it to the making of freight car bodies, welded underframes, truck bodies, etc.

Steel for Ammonia Production

Although the above steels represent major developments from an economic standpoint, the less dramatic improvements in high-alloy steels are also well worth considering. The work done to perfect steels that will show long life in apparatus for the synthesis of ammonia is an example. A number of years ago it was revealed that steel with more than 2 per cent chromium fairly well resisted the corrosive attack of a mixture of nitrogen, hydrogen and ammonia at a temperature of 500 deg. C. and pressures of 100 atmospheres. Later, workers at the Bureau of Standards discovered that tungsten-bearing steel is exceptionally resistant for this type of work, and last year additional experiments were made on a series of chromium-tungsten steels.

FIG. 1.—Cold rolling prior to reheating greatly reduces intergranular corrosion in 18-8 rustless steels. These two specimens were shaped, one by shearing and the other by drilling, after which they were heated at 670 deg. C. for one hour. They were then immersed in $CuSO_4 = H_2SO_4$. Note how the undeformed parts decayed leaving the deformed edges almost intact.

Alloys in the last group were exposed for a period of one year to a 3:1 mixture of hydrogen and nitrogen with 10 per cent ammonia, at a temperature of 300 deg. C. and at a pressure of 600 atmospheres. A steel with 0.81 per cent tungsten corroded when exposed to this gas mixture at 300 deg. C. and 600 atmospheres. But a steel with 2.85 per cent tungsten was not affected. The addition of more tungsten was found not to be beneficial, and as much as 11.69 per cent was detrimental. The addition of 1 per cent chromium to tungsten-bearing steels proved very desirable. It was found that the carbon content should be held at, or below, 0.35 per cent. As would be expected, slag present in the exposed surface was attacked and decomposed, resulting in pitting.

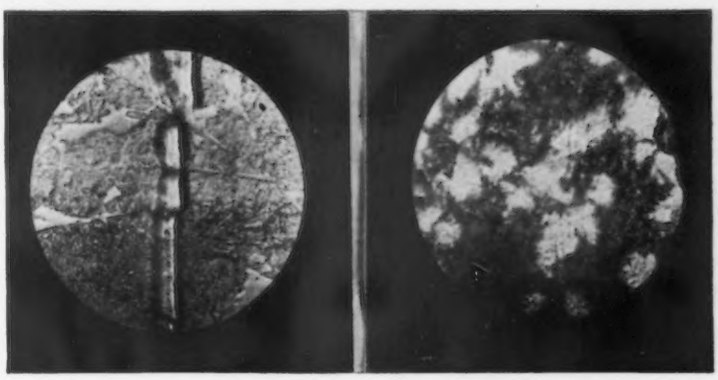

FIG. 2.—By developing the electrolytic Alumilite process for hardening the surface of aluminum alloys, the engineers of the Aluminum Co. of America have attained an objective for which they had long been seeking. At the left a diamond point scratch can be seen on an aluminum alloy piston surface. To the right is an almost imperceptible scratch made under identical conditions on an Alumilited surface, thereby demonstrating its much greater hardness.

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Improvements in Stainless Steels

The experiments made to perfect steels to combat the destructive com-

TABLE I

Data Showing the Very Small Thermal Expansion of Stainless-Invar Metal

Alloy Number	Cobalt Per Cent	Iron Per Cent	Chromium Per Cent	Nickel Per Cent	Coefficient of Expansion at 20 deg. C.
...	...	63.5	...	36.5	1.2×10^{-6}
50	54.5	36.5	9.0	...	0.2
51	54.0	37.0	9.0	...	—1.2
63	54.5	36.0	9.5	...	0.5
64	54.0	36.5	9.5	...	0.0
65	53.5	37.0	9.5	...	—0.8
66	53.0	37.5	9.5	...	—0.6
72	54.5	35.5	10.0	...	0.5
73	54.0	36.0	10.0	...	0.0
74	53.5	36.5	10.0	...	—0.5
75	53.0	37.0	10.0	...	0.2

Data Which Demonstrate the Resistance to Salt Solution of the Stainless-Invar Alloy

	Weight Loss (gm/cm^2)	
Corrosion Interval (Days)	Invar (Fe = 63.5 Per Cent Ni = 36.5 Per Cent)	Stainless-Invar (Co = 54.0 Per Cent, Fe = 36.5 Per Cent, Cr = 9.5 Per Cent)
10	0.00036	0.00000
20	0.00064	0.00000
30	0.00084	0.00000
40	0.00100	0.00000
51	0.00123	0.00001
71	0.00156	0.00001
82	0.00178	0.00002

bination of corrosive action, moderate temperature and high pressure have been paralleled by improvements in stainless steels, and a wider dissemination of information to promote their use. In the efforts to perfect this group of steels, extensive investigations have been made to determine the nature of, and means of combating, the very troublesome inter-granular corrosion in chromium-nickel austenitic steels. Many methods have been suggested for overcoming this defect, and these have generally involved the addition of other elements to the melt. At present titanium is most commonly used as the extra alloying addition, but many trial heats during the past year have shown that columbium may be more effective. In fact, some investigators are now enthusiastically in favor of columbium instead of titanium, because titanium oxidizes almost completely during any welding procedure. This oxidation results in a very undesirable loss of impact strength.

Titanium Improves 18-8

Many mills look with favor on titanium, however, and several investigations to study its action more fully were completed during the year. For instance, two American metallurgists tested four heats of 18-8 with a carbon content between 0.15 and 0.20 per cent. Two of the heats had no Ti additions, and two had a Ti content of 0.66 and 0.98 per cent respectively. The tests were made on hot-rolled rods ¾ in. in diameter. It was found that a heating at 1500 deg. F., even for a long time, is without benefit upon the physical properties, though some improvement is noted in corrosion resistance after holding at the decomposition temperature of 1200 deg. F. At 1500 deg. there is no tendency for carbide agglomeration, thus indicating the stability of Ti carbide. The extra cost was said not to be warranted by the improvement, and tenacious scale, causing pickling difficulties, was formed. When the steel is heated to 1200 deg. F., a Ti addition improves the resistance to attack in the as-rolled condition. Ti 18-8 wire, drawn with process anneals at 1720 deg. F., showed satisfactory physical properties and corrosion resistance, although the properties were slightly lower than straight 18-8, process annealed at 1820 deg. F. As a stabilizing agent for 18-8, titanium was found to be much more efficient than a 1500-deg. F. heat treatment. Disadvantages of a Ti addition include a low recovery of Ti and considerable difficulty in obtaining uniform distribution through the metal.

Rollason's Work

As stated before, much experimenting has been done to overcome the intercrystalline corrosion of fully softened, austenitic 18-8 stainless steel, but it remained for Rollason (England) last year to determine the correlation between the corrosion and (1) cold rolling prior and (2) cold rolling subsequent to heat treatment involving sensitization toward such corrosion. The two alloys which were tested analyzed 0.11 C, 0.33 Si, 0.16 Mn, 18.9 Cr, and 8.41 Ni; and 0.17 C, 0.23 Si, 0.78 Mn, 16.2 Cr and 10.6 Ni.

To determine the influence of cold rolling prior to heat treatment four sets of specimens were reduced in thickness 5, 25, 50 and 75 per cent respectively. Then they were heated and tested to find fields showing maximum decay. In general it was found that cold rolling lowers both the upper and lower limits of decomposition, but with prolonged annealing the maximum intergranular corrosion of cold-worked samples never became so great as that of annealed material. There is a higher rate of intergranular decomposition in a direction parallel to the rolling direction. The prevention of corrosion by cold work is illustrated in Fig. 1.

To determine the effect of deformation after heat sensitization, the specimens were treated within the temperature range of 500 deg. to 700 deg. C., after which they were cold rolled. Such a procedure increases the rate of intergranular corrosion, and uneven cold working is particularly detrimental.

Etching Stainless Steel Welds

Many users of stainless steel of the 18-8 type have found that welds are not entirely satisfactory. This follows from the structural change which often takes place, wherein carbides are formed within and around the constituent grains. To detect this condition, electrolytic etching in a sodium cyanide solution is the usual procedure. But this method has several drawbacks, and the Bureau of Standards has just announced another method for which great superiority is claimed.

This procedure consists of etching electrolytically in oxalic acid (10 gm.

in 10 ml. of water), the specimen being the anode and a piece of platinum the cathode. The current from a six-volt storage battery serves to reveal carbides in the metallographic structure in 15 to 30 sec., and the grain structure is perceptible on etching about 30 sec. longer. The solution does not stain the specimen—a drawback of almost all other methods.

IngOclad

Two new products belonging to the rustless steel family are commanding increasing attention. One of these, IngOclad 23-11 is a new clad alloy produced by the Ingersoll Steel & Disc Co. It is a two-ply stainless steel having a 20 per cent stainless layer of 23 per cent chrome, 11 per cent nickel, bonded to a back of mild carbon steel. This material, when welded with a 25-12 chrome-nickel electrode, it is said to be superior for resistance to the forms of damaging corrosion attack encountered in both sulphite and sulphate pulp and paper mill applications.

Stainless-Invar Produced in Japan

Also of considerable importance to users of stainless steels is the development of stainless-invar metal by Hakar Masumoto of Japan. Not only is this material resistant to the action of a salt solution but it also has a thermal expansion coefficient smaller than fused silica. Therefore it should find use in instruments and apparatus where constant length with varying temperature is a requirement.

In his experiments, Masumoto measured the thermal expansions of ternary alloys of cobalt, iron and chromium, and found that an addition of a small quantity of chromium to cobalt-iron alloys containing more than 50 per cent cobalt considerably reduced their expansibility. The thermal expansion was determined from the temperature of liquid air to the vicinity of the magnetic transformation point. The smallest coefficient of linear expansion found was -1.2×10^{-6} at 20 deg. C. Further it was found that alloys having small expansibility were practically incorrodible in a dilute solution of NaCl.

The test samples were melted in an alumina crucible under a hydrogen atmosphere. Expansion data were then taken on cast specimens, and the coefficients of expansion calculated. These coefficients at 20 deg. are shown in Table I. The smallest coefficient of usual invar metal, containing 63.5 per cent iron and 36.5 per cent nickel, is 1.2×10^{-6}, but a number of the stainless invars shown in Table I have a smaller coefficient of expansion, the smallest being zero, although a negative value such as -1.2×10^{-6} was obtained. Since these alloys have a very small expansibility in an annealed state, they are quite stable and cannot change their property with a lapse of time.

The corrosion-resistant properties of both invar and stainless-invar were examined by the author. The specimens were suspended in a 1/10 gram mol solution of NaCl. Table I also shows these results. It can be seen that invar containing 63.5 per cent iron and 36.5 per cent nickel shows a relatively large loss of weight after 82 days, while in the case of stainless-invar containing 54 per cent cobalt, 36.5 iron and 9.5 chromium, the loss of weight is negligibly small after the same interval of time. The surface of the stainless invar remained perfectly bright without showing any rust spots for this time duration.

Beryllium as an Alloy

As research laboratories are striving to expand the uses of stainless metals, they are likewise devoting considerable attention to alloys of a somewhat different nature, for instance beryllium injections into various alloys. About a year ago, Challansonnet (France) published data concerning steels containing 1 per cent beryllium. It was found that the addition of nickel to a non-carburized steel containing 1 per cent of beryllium progressively refines the grain, and chromium opposes this effect. The age-hardening of a low-beryllium austenitic steel of the V2A type is related to the presence of nickel.

In a study of the hardening-tempering of iron-nickel alloys with 1 per cent of beryllium the author found that the age-hardening was a maximum with 5 per cent nickel, remaining constant at about 600 Brinell up to 22 per cent. The addition of chromium up to 20 per cent has no effect on the maximum hardness (600) nor the amount of nickel required to produce it (5 per cent); if the nickel be raised, however, the steel then reverts to a softer V2A type of alloy. The resistance of special steels containing beryllium to corrosion by acids is less than that of normal inoxidizable steels; up to 1 per cent beryllium is less injurious than carbon, but the simultaneous presence of the two elements increase considerably the susceptibility to corrosion. After a hardening-tempering treatment a steel containing chromium 12, nickel 5, and beryllium 1 per cent develops a hardness equal to that of high-speed steel.

Direct Reduction of Wrought Iron

Information on the direct reduction of iron is always of considerable interest. Therefore the experiments of Hardy, of the Canadian Department of Mines, is important in that his process shows possibilities of producing a good grade of wrought iron directly from sponge iron. The ore he used was first concentrated by wet

TABLE II

Characteristics of the New English Alloy Ceralumin "C", Which Combines Light Weight with High Strength for Die and Sand Castings

	0.1 Per Cent Proof Stress Tons Per Sq. In.	Maximum Stress Tons Per Sq. In.	Elongation Per Cent	Brinell Hardness Number
CHILL CAST				
Fully heat treated	21-24	23-27	1.0	132-140
Quenched from 535 deg. C. in H_2O and aged 5 days at room temperature	13-14	19-21	4.6	98-104
No heat treatment	11-12	13-14	1-3	67-77
SAND CAST				
Fully heat treated	18-20	19-20	0.1	130-140
Quenched from 535 deg. C. in H_2O and aged 5 days at room temperature	11-13	14-16	1-3	98-104
No heat treatment	.....	8.5	0.1	72

FIG. 4.—Electrical power is now priced lower than for any period since the war. Consequently non-ferrous founders are finding it increasingly profitable to install electric furnaces for the production of improved products, such as this worm gear blank made by the McGill Mfg. Co.

magnetic separation, and the 300-mesh fines in the dry state contained 71.63 per cent of iron, 1.12 per cent silica, and low phosphorus and sulphur. These fines were sintered, then reduced either by charcoal or by city gas, and the final product contained about 94½ per cent of metallic iron. The sponge iron was briquetted and then heated to 2400 deg. F., hammered, piled, and rehammered. The carbon, manganese, sulphur and phosphorus contents of the bars were in line with those of commercial wrought iron, but the slag content was too high; the tensile strength was fair, but the ductility and toughness were low. Further hot work, with the probable expulsion of more slag, improved the properties, which finally became 43,500 lb. per sq. in. tensile strength; yield point, 37,500 lb. per sq. in.; elongation on 2 in., 20 per cent; and reduction of area, 18.8 per cent. A cold bend test showed, however, that the metal lacked ductility. It is thought that the addition of small amounts of suitable flux before sintering should render the slag more fusible and so render its expulsion more easy and complete.

The United States Bureau of Mines also recently published results somewhat similar to the above. Sponge iron was briquetted at a low temperature and then heated to a temperature above the melting point of iron silicate, but below that of iron. A solid iron and molten silicate combination was thus formed. Most of the slag was removed by hammering and rolling and then, in a single step process, briquets of ore and 15 to 18 per cent reducing agent were passed through a muffle furnace and subsequently hammered. Using coal containing 0.8 to 1.0 per cent sulphur, the iron finished with 0.04 per cent sulphur. Combined carbon was less than 0.05 per cent, and occasionally less than 0.02. The upper limit of slag content was 25 per cent, and a lower percentage of reducing agent gave a less siliceous slag and more slag volume with better forgeability. The properties of the iron were within specifications for commercial wrought iron.

Ingot Shakers

At least one steel mill in this country is installing an ingot shaker; consequently the interesting report of Herzog on such an installation in the German Thyssen works should be noted. At that plant the ingot molds were fixed on a converter-bottom jolting machine. Preliminary tests with electric steel showed that with heavy jolting the treatment could not be commenced until the top of the ingot had frozen over completely. A number of experiments with unkilled mild basic Bessemer steel ingots revealed the development of very decided zones of segregation; their position and arrangement within the ingot depended on the mode of jolting, and with uninterrupted jolting they offered a good means of determining experimentally the progress of freezing. According to earlier work, the jolting of steel ingots is not economic, but for a final decision the author concluded that further tests must be carried out with a lighter jolting machine with variable jolting.

Cast Iron Regaining Lost Ground

Transferring this review from steels to cast iron, it can be said that although for a time cast iron lost prestige in favor of competing materials, there is every indication that this common material is gradually regaining lost ground. This recovery is based to a considerable extent on the turning of founders to electric furnace melting as rapidly as economic conditions permit the change. Thus the iron melts are more easily regulated and are more dependable, the melting is faster and superior to older methods, the metal is more homogeneous, and better control of alloying elements is assured. In addition a greater variety of metals can be poured each day, thereby assuring each customer the physical properties which are desired at minimum expense to the foundry.

Poor cupola iron is a brittle material with a tensile strength around 30,000 lb. per sq. in., whereas close technical control may lift this strength by about 20,000 lb. per sq. in. But a ductile electric iron with a strength of 80,000 lb. per sq. in. is possible, and with discreet inoculations of alloying elements, such as nickel, chromium, molybdenum, copper, silicon, vanadium, titanium, etc., the strength can be raised to well over 100,000 lb. per sq. in. Such a strength can be combined with a great variety of ductilities and abrasion, shock, and corrosion resistances which vary with the admixture of elements.

A number of foundries have seen fit to meet more severe marketing conditions by the use of electric furnaces, and around 30 installations

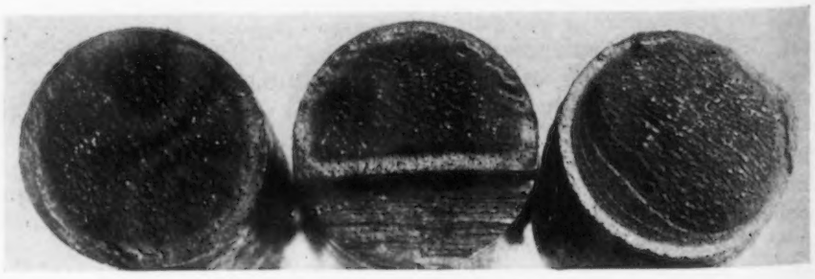

FIG. 5.—A liquid carburizer recently introduced into this country after several successful years in Germany. The Houghton method can be controlled accurately and is designed to rapidly and economically harden small parts. The above examples are nickel-chromium (C, 0.10; Ni, 3; Cr, 0.8) steels carburized at 1650 deg. F. for 120, 80 and 40 min., from left to right respectively. Notice the thickness and clear outline of each case. At 6 diameters.

totaling about 4000 kilowatts were placed in operation during the past 12 months. A number of these concerns are now turning out low-priced gray iron castings which are comparable from a physical standpoint with malleable iron and steel castings.

As founders are turning to electric melting to secure improved irons, so are they becoming cognizant of the advantages of electric furnaces to superheat iron melts. With a controlled melting atmosphere the bath temperatures may be held sufficiently high to thoroughly dissolve all graphite carbon before tapping. To show this, test bars were cast by Worthington Pump & Machinery Corpn.—one tapped at 2650 deg. F., and the other tapped at 3000 deg. F. The superheated iron showed a 21.5 per cent improvement in transverse strength, 42.9 per cent increase in tensile strength, and advances in hardness and deflection. Although the superheated iron was 7.5 per cent harder, it was also found to be 6.2 per cent easier to machine.

Influence of Maximum Heating Temperature on Cast Iron

The study of the influence of maximum heating temperature on gray cast iron has been the subject of many investigations at the Bureau of Standards, and additional data on this subject have just been released. Four batches of each of three irons were prepared by heating to 1400, 1500, 1600 and 1700 deg. C., respectively. The strength of a bar of a given diameter was found to depend on the maximum heating temperature. In two types of iron (2.03 and 2.70 C, 0.019 and 0.021 S, 0.15 and 0.23 Mn, 0.65 and 0.86 P) the maximum strength did not occur at the same maximum heating temperature for bars of different diameter. In a third type of iron (1.17 Si, 0.054 S, 0.56 Mn, and 0.10 P) the transverse breaking strength increased progressively up to 1600 deg. C. for bars of all diameters.

In general the running quality of these irons was not materially affected by the maximum heating temperature, but was more of a function of the liquidus temperature. For any two irons poured at the same temperature, the running quality was found to be better in the case of iron having the lower liquidus temperature. The microstructure of the samples showed that high strength is associated with relatively small graphite flakes and a pearlitic-sorbitic matrix.

New Cerium-Aluminum Alloy Developed

It has been amply demonstrated that 1934 was a busy period for investigators of ferrous alloys. However, the year was even more fruitful for the non-ferrous industry. Many non-ferrous metals are competing with ferrous alloys, and indications are that users in the future will find even more non-ferrous alloys suitable for complex manufacturing processes. Even now there is an increasing commercial application of alloys which combine the high corrosion resistance characteristic of copper with physical properties comparable to the steels and similar structural materials.

A new light aluminum alloy of low specific gravity and high strength, combined with good casting properties, was introduced late in 1934 in England under the name of Ceralumin "C." This complex aluminum alloy is novel in that it contains the rare element cerium—the complete analysis is copper 2.5 per cent, nickel 1.5, magnesium 0.8, iron 1.2, silicon 1.2, cerium 0.15, and aluminum 92.65 per cent. Investigators claim that the cerium has a refining action on the macrostructure; also that it allows the beneficial mechanical effects of a high iron content to be obtained by suppressing the embrittling iron-aluminum which is otherwise liable to be formed.

In the heat-treated condition, Ceralumin "C" presents an excellent combination of high tensile strength at ordinary and elevated temperatures, high elastic limit and high Brinell hardness. Likewise the fatigue strength is high, being about 20 million reversals of ± 8.25 tons per sq. in. on a Wöhler machine. The characteristics of this alloy for the chill and sand cast conditions are shown in Table II. The full heat treatment is fairly simple. The castings are maintained at the solution temperature of 515 deg. to 535 deg. C. for four to six hours, and then quenched in water; aging is achieved by heating to 175 deg. C. for 16 hr., followed by quenching in water. There is said to be very little risk of distortion during heat treating. This material is now being used to a considerable degree in England for airplane and automobile die castings.

Surface Hardening of Aluminum Alloys

In using aluminum alloys it is often desirable to increase the hardness of the surface. The engineers of the Aluminum Co. of America have gone

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FIG. 6.—A hard but ductile case can be rapidly produced on free machining and inexpensive steels by the Chapmanizing process. Active nitrogen is fed into a liquid bath which also heats the metal under treatment. These curves show various hardening tests on similar steels, demonstrating the rapid action of the Chapman process.

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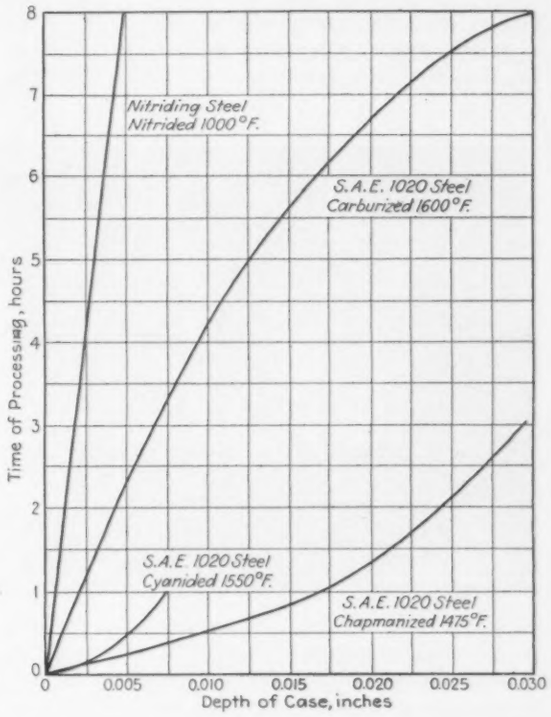


far in this direction in their new electrolytic treatment (Alumilite process) of their Lo-Ex alloy. The equipment for the treating resembles that of electroplating, but the oxide surface resulting is made from the parent metal and is not a layer of material deposited on the surface. Consequently the finish has a high tenacity combined with the hardness and smoothness of a fine bearing surface. All machining and grinding are done before treatment, and the thickness of the Alumilite finish can be controlled uniformly and within close limits. Such a treatment of this alloy is finding its largest use in the improvement of automobile pistons, al-

though such an integral hard surface is of potential value to many other industries. A microscopic proof of the improved surface and greater hardness is shown in Fig. 2.

New Copper-Zinc Alloys

Another non-ferrous development consists of a series of Cu-Zn alloys with silicon additions, which has proved to be quite popular in England for replacing more expensive Cu-Sn alloys. Among the compositions now being used are 84 per cent copper, 4 per cent Si, and 12 per cent zinc; 86-4-10; 87-3-10; 88-4-8; and 90-2-8. These five different alloys solidify at 1690 deg. F., 1750 deg., 1800 deg., 1780 deg., and 1890 deg. F., respectively.

The combinations above are very fluid at elevated temperatures and can be poured at temperatures below the vaporizing temperature of Zn, thereby minimizing the losses of the latter by volatilization, and the corresponding contamination of the castings is practically eliminated. Also, these alloys are said to fill out the castings better than common Sn bronzes or brasses, which makes sound thin-walled castings more practical. Castings can be made in green and dried sand as well as in iron molds, green sand molds being preferable. These bronzes possess satisfactory hard-working properties, and they have been successfully used as bearing metal for large bells.

Tungum

For ornamental work and fixtures which must withstand contact with salt water, a newcomer in alloys which bears the proprietary name of Tungum is also finding favor abroad. It resembles gold in appearance and is said to resist tarnish equally as well. Tungum is a copper alloy, and in the rolled condition has a maximum stress factor of from 29 to 46 tons per sq. in., an elongation in 2 in. of from 51 to 17 per cent, and a reduction of area from 62 to 49 per cent. The figures for forged Tungum are 25 to 27 tons per sq. in., 71 to 59 per cent, and 68 to 71 per cent, while in the cast condition these physical properties become 16 tons per sq. in., 31 per cent and 38 per cent respectively.

With regard to torsion, Tungum in the rolled condition gives a maximum shear stress of 29.98 tons per sq. in. on a test piece of $\frac{5}{8}$-in. diameter, while the forged alloy gives 29.70 tons on a $\frac{3}{4}$-in. diameter test piece. Izod tests were carried out on specimens of one centimeter square cross-section of rolled soft and forged soft Tungum which gave results of 65 and 74 ft. lb. respectively.

According to published tables, after tests in salt water for 300 hr. Tungum is said to be totally unaffected. Again, in acid-laden atmospheres its resistance to corrosion should prove of considerable value; and its ductility should make it amenable to the tools of the ornamental metal worker. It has already been used for making a number of propellers for English ships.

Another development the past year was that of a German experimenter who produced a selenium alloy of high thermoelectric power, which will probably find particular use for radiation pyrometric measurements. The couple combination of Cu_2Se-Se possesses a thermoelectric power which varies almost linearily from 17 millivolts at 70 deg. C. to 225 millivolts at 655 deg. C.

A Synthetic Diamond

One product of the research laboratory which shows all indications of great commercial value is the new boron carbide of the Norton Co. It is a combination of the rare metal, boron, and ordinary carbon such as occurs in coke. This unique material is unaffected by the strongest acids and alkalis, it has a compressive strength of 260,000 lb. per sq. in., a coefficient of expansion approximately two-thirds that of steel and is little affected by temperatures up to 1000 deg. C., at which point the diamond burns completely. Also, it is lighter than aluminum. The new boron carbide, however, is not so strong either in compression or cross-bending as cemented tungsten carbide. This limits its use to mechanical fields similar to those occupied by the diamond, which is inherently brittle.

The industrial applications of boron carbide depend entirely on its unique property of hardness. Its future general use for grinding wheels, abrasive papers and the like will depend on economic considerations, since the product is necessarily more expensive than silicon carbide. It can be melted in the liquid phase; therefore it can be used for self-bonded articles of great hardness, notably pressure blast nozzles such as are illustrated in Fig. 3. It has already displaced gems in such highly different uses as bearings in electric meters and high-speed rotating spindles on grinding machines, and is being used for extrusion and wire drawing dies

wherein the high polish and hardness result in extremely long life. It is also displacing the ordinary porcelain and synthetic ruby guides used on weaving and spinning machines.

Electric Furnace in Non-Ferrous Melting

As in gray iron foundries, the electric furnace is also being used more by non-ferrous melters, and one example of many showing the advantages of such equipment is shown in Fig. 4. A worm drive gear is cut from the cast blank which is shown. This worm gear in service travels 10,000 r.p.m., and the wear in service is a major factor to overcome. As formerly made in a crucible furnace the casting metal had a composition of 88.5 per cent copper, 11 of tin, 0.25 of lead, and 0.25 per cent phosphorus. When melted in the electric furnace the composition was changed to analyze 89 per cent copper, 9 of aluminum, and 2 per cent iron. The wear resistance was found to be improved by 100 per cent. The electric casting was found to be more homogeneous and the metal had a more uniform and dense structure than the previous crucible-melted product.

Perliton Liquid Carburizer

In conclusion, two important developments in the carburizing of steels should be examined, as they represent distinct advances in an age-old art. The Perliton liquid carburizer of E. F. Houghton & Co. was introduced to this country in 1934, after several years of successful operation in Germany. This procedure is very easily controlled and is particularly adapted to a large number of small parts which require rapid treatment at a low cost.

The new Houghton Perliton liquid carburizer consists of two materials, namely, Houghton's Perliton liquid heat and Houghton's Perliton carbon. The liquid heat is melted in a pot to within 3 or 4 in. from the top, whereupon small quantities of the Perliton carbon are added to the surface of the bath.

The work can be strung on rods or placed in a metal basket and immersed in the bath for a time depending on the case depth desired. In one test about 56,000 lb. of steel was treated in 1237 hr., consuming 1 lb. of liquid heat to each 75 lb. of steel, and 1 lb. of Perliton carbon to each

300 lb. of steel, at 1650 and 1675 deg. F. Cast steel pots are generally used and the pot life is said to be twice that as when cyanide is used. Using S.A.E. steel 1020, quenched in water, a case depth of 0.018 in. can be obtained in two hours at 1600 deg. F.

In Fig. 5 there is shown micrographically the relative penetration of the case for various times of immersion. Note the clearly defined skin and the close relationship between time of action and depth of case.

Chapmanizing

The Chapmanizing process of the Chapman Valve & Mfg. Co. stresses the hardening, with a minimum of distortion, of intricate metal parts made of cheap steels. Thus manufacturers can substitute low-cost carbon or free-machining steels for expensive alloys and steels for parts which only require a hard surface. Users claim that a carefully controlled hardness can be produced for any desired depth, from 0.002 in. to 0.030 in. The case will scratch glass and the Monotron Brinell hardness ranges from 700 to 1100. In addition, the case is somewhat ductile and is said not to chip or flake under hard service or moderate bending. The manufacturer claims that the surface will withstand abrasive wear in a proportion of nine to one as compared with some carburized metals. Chapmanizing also can be applied to malleable iron without excessive loss of ductility or increase in brittleness.

The Chapmanizing process is based on the fact that iron-base alloys will absorb certain hardening elements when heated either above or below the critical temperature of the alloys. A liquid bath is used to convey the necessary heat to the part, and active nitrogen is delivered to the metal under treatment and penetrates the surface of the metal to a considerable depth. A Chapmanizer, which is part of the equipment, contains an electrical reaction chamber wherein ammonia is dissociated to supply the active nitrogen. After treatment, the parts emerge from the bath free of scale or dirt and with a bright, silvery finish. The rapid manner in which a case can be produced is well illustrated in Fig. 6.

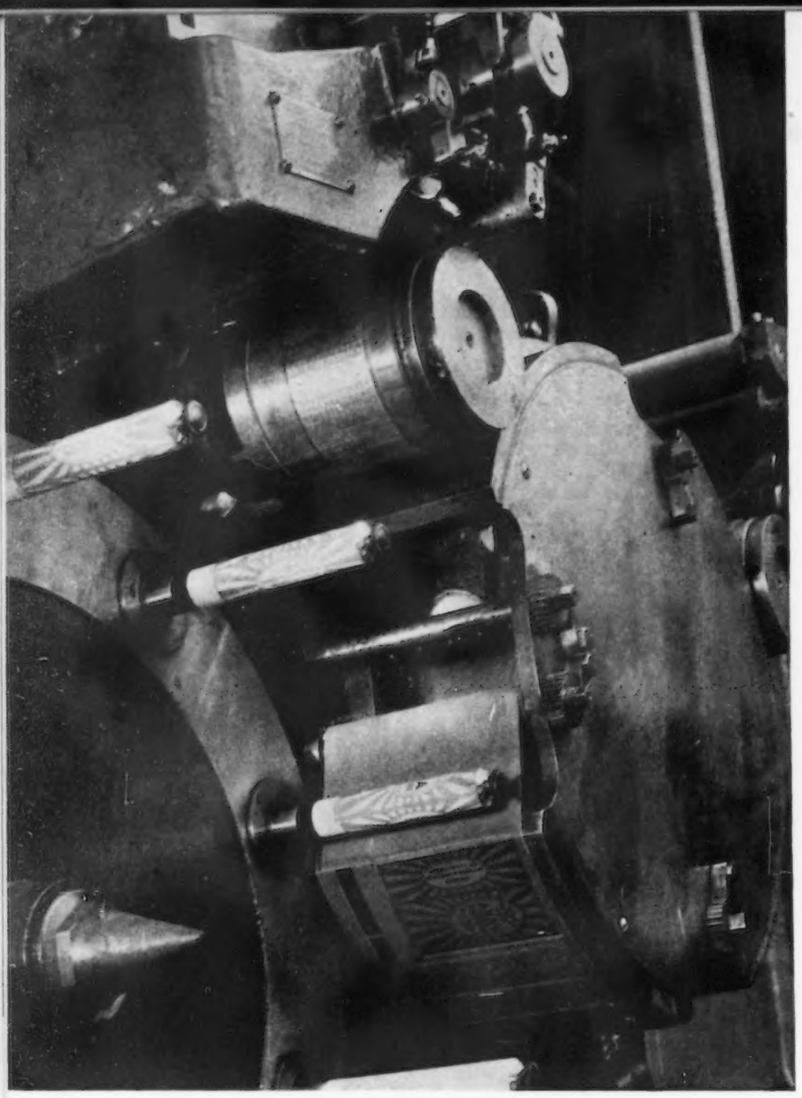
November Manufacturing Activity Declined

MANUFACTURING activity experienced a usual seasonal decline in November, according to reports from manufacturing establishments in 25 industries announced by the National Industrial Conference Board. The number of wage-earners employed fell off 3.0 per cent from October to November. Although employment was 1.4 per cent higher than in November, 1933, it was 24.5 per cent lower than in November, 1929.

Total man-hours and total payroll disbursements declined 3.2 per cent and 2.8 per cent, respectively, from October to November. The decline since November, 1929, in both total man-hours and total payrolls amounted to 44.5 per cent. Very little change in average earnings and hours per week from October to November was indicated. Average hourly earnings rose from 59.3c. to 59.4c., or 0.2 per cent. Despite a slight decline in the average number of hours worked per week from 34.0 hr. to 33.9 hr., average weekly earnings increased from $20.01 to $20.08, or 0.3 per cent.

Ernest E. Lee Co., 53 West Jackson Boulevard, Chicago, has been appointed by the Coppus Engineering Corpn., Worcester, Mass., to handle sales of Coppus air filtrs for air compressors, internal combustion engines, industrial, and ventilating applications.

The Year's



THE year witnessed improvement in high speed automatic lithograph machinery for decorating metal containers. On this modern machine the two smaller rolls are engraved. That on the right bears the radiating design printed in red. The roll on the left picks up the black ink and bears the lettering and the band at the bottom of the tube. The large cylinder is fitted with a rubber mat which picks up the impressions from the small rolls and then as it comes in contact with each station spins this impression on to the tube surface.

Courtesy Sherwin-Williams Co.

IN nearly all branches of the metal-working industry a marked increase in appreciation of the commercial significance of good finish was undoubtedly one of the major developments of 1934. Important progress was made in the technique of plating and in the closely associated processes of pickling and burnishing. Manufacturers of enamels and lacquers took long strides toward that hypothetical goal, the perfect metal coating.

Zinc producers were enthusiastic over two outstanding events during the year—the completion of extensive exposure tests of plated coatings and the first commercial production in this country of the heavy zinc coatings on wire made possible by electrogalvanizing.

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LAST spring a designing engineer changed the color of a small metal and rubber reducing roller and thereby increased its sales by 120 per cent. This is but one of a multitude of examples occurring during the year where the nature of the finish of a metal product has been an important factor in sales expansion.

Most applications in metal finishing fall under two broad classifications; appearance and protection. These two overlap, and appearance over the long term certainly must include surface protection. For such products as fence wire, highway hardware and windmills, appearance has minimum importance and the all-important surface feature must be protection against weather. In this particular field exposure tests of different coatings on steel become highly important. An increasing interest in more durable coatings for the protection of metals is a definite current feature, according to W. M. Phillips, research division, General Motors Corpn., Detroit, who reports: "The problem of proper coating is being attacked from many angles and the past year has shown great progress both from the viewpoint of things accomplished and things initiated.

"Of broad significance was the completion of exposure tests of plated coatings on steel which involved the exposure of 7000 panels plated in many different ways and exposed under different climatic conditions from Key West to Sandy Hook. The individual inspections ran into the hundred thousands and the results have been boiled down into useful specifications, which for the first time will tell industry just what is required to get a satisfactory job of plating for the use intended. This work was the combined effort of the American Society for Testing Materials, the American Electro-Platers Society and the U. S. Bureau of Standards. The results of the test will be published in some detail in the U. S. Bureau

Progress in Metal Finishing

By HERBERT R. SIMONDS

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of Standards Journal, and it is difficult to overestimate the value this will have for industry."

In the field of metal protection one authority has stated unequivocally that the most important development during the year was the introduction into the commercial field of wire with heavy zinc coatings such as is possible to produce only by electrogalvanizing.

Dr. Fink's Review

IN a brief review of plating progress during the year, Dr. Colin G. Fink, head of the division of electrochemistry at Columbia University, points to a number of interesting and commercially important developments in corrosion protection and appearance of metal surfaces. He gives the following highlights under different headings:

Aluminum. — The anodic treatment of aluminum and aluminum alloys has progressed rapidly and is now an established industry. An important addition is the anodic treatment of aluminum for the production of a mirror surface. On this subject Dr. Harlow Shapley has stated that wholesale aluminizing of astronomical mirrors, replacing silvering, has gone ahead this year, culminating in the aluminizing of the Lick Observatory Crossley reflector, and that silvering in a few years will probably exist only on the historical shelf.

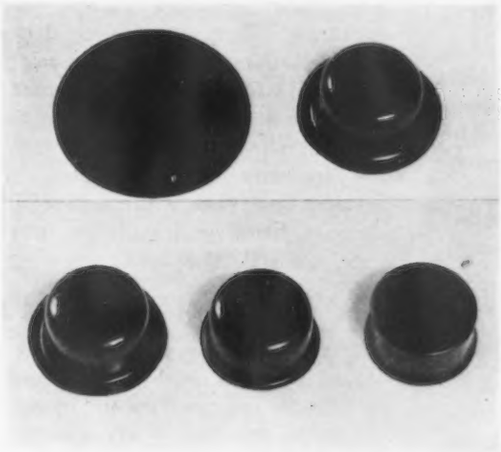
Cadmium and Zinc Alloy.—The co-deposition of cadmium and zinc has been carried out on a large scale and the protection thus given to iron and steel parts appears to be better than with either cadmium or zinc alone.

Cobalt, Nickel and Rhodium.—The co-deposition of cobalt and nickel as an undercoat for rhodium has found application in the manufacture of a large number of reflectors. The cobalt-nickel alloy containing about 25 to 40 per cent cobalt is the whitest alloy known. It compares favorably with freshly polished silver and thus forms an ideal undercoat for rhodium.

Rhodium reflectors are the standard for airplane course markers.

Rhemium.—A newcomer in the field of practical coatings is rhemium plate. The plate is remarkably free from pinholes and is highly resistant to cold and warm hydrochloric acid solutions. At present the supply of the metal is rather limited, but searches for larger sources of supply are under way.

Tellurium.—Electrodeposition of tellurium from fluoride solutions was demonstrated a few years ago. It has now been found that a thin deposit of tellurium on lead, and the plate subsequently heat-treated so as to allow the tellurium to alloy with the



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A LAGGING demand for cigarette lighters was suddenly increased beyond the plant capacity by the use of a new design which included a bright color metal finish. Half chromium and half bright lacquer proved a popular combination.
Courtesy New Jersey Zinc Co.

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FLAT steel strip coated with one coat of a new metal-container finish is first blanked and then passed through four drawing operations to produce the final form.
Courtesy Continental Can Co.

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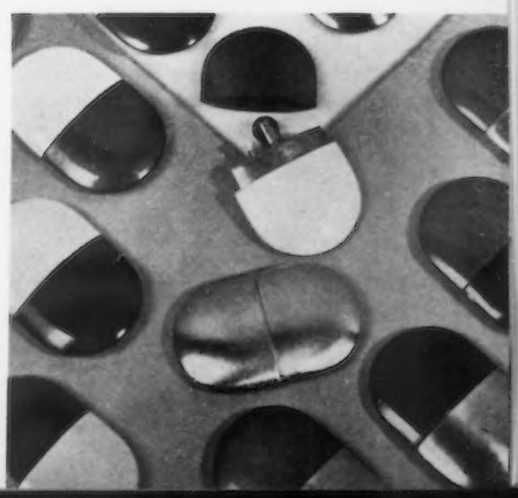

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BLACK nickel plate and pleasing simplicity of design made this new type of chair a favorite.
Courtesy Raymond Loewy

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lead, has resulted in a lead surface by far more resistant to acid attack than the tellurium-free lead surface.

Tin.—An elaborate research program is now being carried out on tin and its applications. The old process tin plate has a number of new competitors. Thus, one of the oil companies is marketing its oil in copper-coated steel cans, rather than tin-coated cans. There is no basic reason why tin plate of decidedly better quality than much of the tin plate turned out today cannot be produced uniformly.

Zinc.—A new process has been commercialized for the electrodeposition of zinc directly on steel wire from an acid sulfate bath derived from the leaching of roasted zinc ore. The process is considered cheaper than any of the older galvanizing processes.

Design and Style

CHANGES in style occur in the finish of metal products just as they do in other fields. In 1932 and 1933 bright plated metal furniture had a vogue. Now there seems to be a tendency, on the part of some designers at least, to introduce variations either through lacquer finishes which are now practical on some furniture for the first time, or by use of new electrodeposited coatings, one of which is a black nickel plate having, except for color, the same characteristics as the normal nickel plate.

A manufacturer of tanks and boilers introduced a wrinkle lacquer finish during the year with great success, which he attributes in part to the end of prohibition with its demand for better finish of basement equipment. Air ducts, furnace coverings and similar basement features ordinarily considered outside the realm of decorative art are now being dressed up so that guests may be invited to wine cellars or new below-ground game rooms. The increased importance of design in the metal industry is evident from the large fees being paid to specialists by some manufacturers. Even such unlikely items as railway locomotives are now being redesigned for better appearance, which also includes more attention to metal surfacing. A new metal furniture company recently started in Greater New York with commercial prospects based principally on new types of metal finish.

Lacquers and Enamels

IN the automotive and electric refrigerator fields new synthetic resins have greatly increased the life of surface finish, according to Mr. Phillips, who reports the use of phosphates under enamels on parts designed for severe exposure.

A new aluminum paint is reported by Aluminum Industries, Inc., Cincinnati, Ohio. By the process employed in producing this paint the clusters of dry pigment that are always a problem are said to be broken up completely by placing them in an especially constructed vacuum cylinder and then exploding them. The pigment thus prepared is combined with a new synthetic vehicle said to prevent oxidation and discoloration. The manufacturer states that a special heat-resisting type of this new paint may be safely used on surfaces exposed to a temperature of 1000 deg. F.

Among several recently developed special finishes reported by the Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J., is a color coating which is applied by means of a roller to strip steel. This is available either in transparent or opaque effect and is said to stand up under subsequent slitting, blanking and forming of the strip into intricate objects. Another new product of this company is an air drying lacquer for use on aluminum die castings where adhesion has always been a problem. This lacquer is said to withstand washing with soap and water and all usual treatment of kitchen utensils.

In response to a demand for a green patina finish for white cast metal, in order to imitate bronze castings, the Lead Industries Association suggests the following formula as successful when applied by dipping:

Copper nitrate	8 oz.
Ammonium chloride	4 oz.
Acetic acid	4 oz.
Chromic acid	1 oz.
Water	1 gal.

Cleaning and Descaling

THE importance of proper preparation of metal surfaces before finishing was perhaps more fully appreciated in 1934 than ever before. In galvanizing, cleaning is said to have received more attention in research work than any other part of the process, and there were many developments in electrocleaning. Also many new products and processes have been introduced for general metal parts cleaning and descaling.

The Dow Chemical Co., Midland, Mich., reports the development of a new solvent during the past year for use in vapor and liquid phase metal degreasing. This is a specially prepared chlorinated hydrocarbon which is said to possess definite advantages over previous solvents due to its very low rate of corrosion. Claims for this new cleaning agent include high boiling point, corrosion reduced to a minimum, and general toxicity less than with previous processes.

The Dreisbach Engineering Corpn., New York, reports improvements during 1934 in its process for cleaning hot rolled and annealed strip, sheet, plate, bar, rod and wire of carbon and stainless steel, bronze and non-ferrous alloys. The company states its process is now operating with 10-lb. pressure and producing clean, smooth surfaces at costs ranging from 4/100c. to ½c. per sq. ft. of surface.

The Magnus Chemical Co., Garwood, N. J., reports a new process which is described as follows: "Work to be cleaned is immersed in a solvent of high penetrative properties, which contains an effective emulsifying agent. The solvent penetrates the oily dirt upon the work and unites with it and also wets any solid particle dirt which may be present. It is used for what might be called a precleaning operation, which is said to reduce the overall cost when the usual cleaning operations follow. In this regard one large manufacturer gives the following production figures: 0.0018c. per sq. ft. for vapor degreasing, 0.00047c. for cleaning with the new Magnus process, and 0.0004c. for cleaning by immersion in boiling alkaline metal cleaner solution. In the last case wiping with naphtha was necessary before parts entered the cleaning process."

Plating

STANDARDIZATION of plating operations and of quality of results has been vigorously sponsored by the Master Electroplaters' Institute, and a decided improvement in character and uniformity of technique is promised in this field. The American Society for Testing Materials is also at work on standardization of electrodeposited coatings. Improved microscopic and chemical tests, including drop tests and stripping tests, of electrodeposited coatings, are to be given careful study in the near future, according to W. M. Phillips, who in reviewing some features of the year's progress speaks of marked improvement in plating equipment, especially in the design of less expensive full automatic equipment which makes it possible to put smaller runs through the plating process at much lower cost than heretofore. He says that straight anodized aluminum is being used in the electric refrigerator industry and that this same surface on aluminum, variously dyed, is finding a new place in the decorative field. In the field of buffing, which is closely associated with plating, Mr. Phillips speaks of better graded abrasive grain, improved understanding of wheel characteristics, and an increased application of automatic features in buffing equipment.

The Copperweld Steel Co., Glassport, Pa., which for some years has been producing a copper coated steel wire, is said to have perfected during the past year a new method of applying copper by electrodeposition. This company's previous method of producing copper coated wire was to surround a billet of steel with a sleeve of copper at temperatures which would produce a close bond. The combined billet was swaged and finally drawn to the desired diameter.

Bright Nickel Plate

THE Pyrene Mfg. Co., Newark, N. J., has a new process for bright nickel plating and states: "Thick deposits of high brilliance can now be obtained even at high current densities, thus eliminating the necessity of subsequent polishing or color buffing, and also eliminating reracking or recleaning previous to chromium plating. The throwing power of a chromium solution is higher over our bright nickel deposit than over ordinary nickel plate."

The U. S. Galvanizing & Plating Equipment Corpn., Brooklyn, N. Y., as mentioned elsewhere, has a somewhat similar bright nickel process brought over from Europe.

The basis of some of the development work in bright nickel plating consists essentially of adding sulphonated acids of the aromatic series to the usual plating bath in order to cause finer grain structure in the nickel which is plated out of solution. In many cases this process eliminates the necessity of buffing or burnishing the parts after plating. It is also claimed that satisfactory heavy nickel plates can thus be deposited direct, eliminating the necessity for undercoats of copper.

An example is the bright nickel plating of a new can opener used in connection with gas station sealed metal oil cans. These can openers are plated directly on steel with a nickel coating from 0.0025 to 0.003 in. thick and are bright, attractive and durable just as they emerge from the plating process without further polishing.

Barrel Plating of Chromium

BARREL plating has taken some important forward steps and barrel plating of chromium is said to have passed the laboratory stage and now to be ready for commercial application. A combination of bright nickel dip with chromium following is reported in actual use with the

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THIS is a view of the interior of a tank car which has been lined with a special enamel which protects it against caustic. The car is used for handling hot 50 per cent caustic.
Courtesy The Watson-Standard Co.

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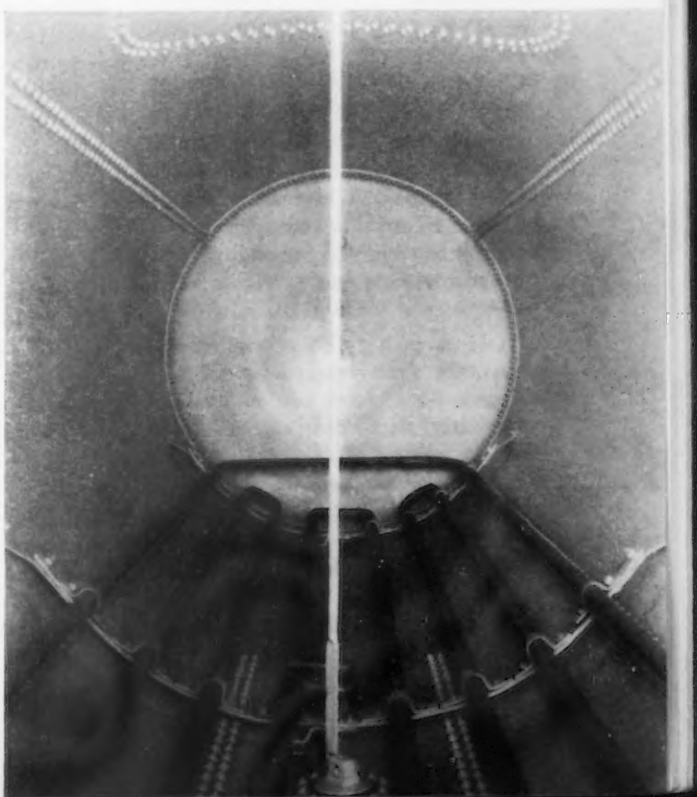


elimination of three previous operations and with a reduction in overall cost of nearly 75 per cent as against previous methods. The new method uses a barrel bright dip nickel followed, without intermediate burnishing or buffing, by a barrel chromium with a final result which needs no buffing. The operations eliminated are two burnishing processes and the racking of parts necessary in the previously established practice of chromium plating.

Corrosion Protection

KEEN competition in the field of protection of metal against corrosion has developed between plating and enameling interests. Tank cars for transporting caustic may be made of steel plated with nickel, cadmium, or other metals, or they may be of steel coated with special resistant enamels. The Watson-Standard Co., Pittsburgh, reports the development of a new enamel for this particular use. This, it states, is a scientifically prepared protective covering of a paint-like nature, which contains resin composed principally of rubber hydro-carbon derived from crepe rubber. Modifications of the composition are said to make this coating resistant to most of the ordinary acids, as well as to brines, gasoline, and oils and greases.

Weathering of Metals

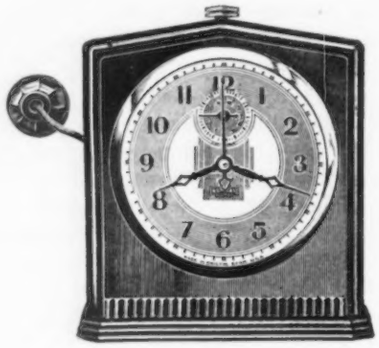
THE various papers of the important symposium on outdoor weathering of metals and metallic coatings held during the year at Washington have been published recently by the American Society for Testing Materials and the following is a brief synopsis of the results.

As regards black iron and steel sheets, a content of copper up to at least 15 per cent substantially improves the corrosion resistance to the atmosphere, but corresponding improvements were not found in tests under water.

As regards hot dipped zinc coated sheets, the time required for the development of the first rust spot varied so greatly with different localities that no general conclusions could be drawn except the very important one that in the use of this material, intended locations should be a factor in drawing up specifications. A table which lists the time of appearance of first rust with different weights of zinc shows that no corrosion had started at State College, Pa., and Sandy Hook, N. J., after six years on specimens with a thickness of coating of 1.5 oz. per sq. ft. At Pittsburgh, with the same thickness, rust spots appeared in three and a half years, and at Altoona, Pa., three years.

Zinc Coated Hardware

AS regards zinc coated commercial hardware, the coatings as a whole were judged to be less uniform than hot dipped coatings on sheets.



A NEW type of inexpensive decorative clock was developed during the year. This has a die cast shell finished with lacquer.
Courtesy Sherwin-Williams Co.

Shapes of specimens distinctly affected the uniformity of the plated coats and evidence of selected specimens indicates that all three types of zinc coatings can be equally protective when good uniformity is obtained.

As regards other coatings on commercial hardware, hot dipped aluminum affords good protection. Parkerizing shows up poorly in the tests. Lead coatings are generally poor, but seem to approach parity with the best coatings in industrial atmospheres. Cadmium plated specimens under test are consistently less protective than the plated zinc ones.

It will be noted that the above tests do not cover wire. However, F. F. Farnsworth, Bell Telephone Laboratories, New York, and chairman of Committee A-5 on Corrosion of Iron and Steel, of the American Society for Testing Materials, reports that plans are now complete for extensive wire tests and that a statement covering the procedure of these tests on galvanized wire and wire products will be published about the first of February. One of the important features will be exhaustive tests of fence wire under conditions which will give knowledge of behavior in practical use. One of the objects of the tests will be to set up national standard specifications for fencing and barbed wire which will afford consumers an adequate guide in purchasing these materials.

Stainless Steel Fence

AN interesting point in connection with the fence wire is the fact that during the past year some manufacturers have produced fencing made of stainless steel wire drawn to smaller sizes to take advantage of the increased tensile strength of this material. It is said that the cost of the product thus made is very nearly on a competitive basis with high grade galvanized fencing. Tests of stainless steel wire will be part of the program of Committee A-5.

Commenting on a similar development, R. E. Hess of the American Society for Testing Materials states that an outstanding development of 1934 was the revision of specifications for black and hot dip zinc coated welded and seamless steel pipe to include galvanizing requirements. This action was taken to meet persistent demands and the result is expected to be far-reaching in the industry.

One of the criticisms of hot dipped galvanized wire has been the lack of uniform thickness of the coating due to the action of gravity as the wire emerges from the dipping tank. Experimental work in two directions has been carried on during the year to offset this defect. One is called steam wiping, which consists of jets of steam rapidly revolving about the wire just after it comes from the zinc bath. The other method is based on vertical emergence of the wire from the bath. Sponsors of both methods predict practical commercial results within the near future.

In the field of electrogalvanizing this country is admittedly behind practice in Europe, but specifications calling for a thickness of zinc coating beyond that successfully obtainable by hot galvanizing have already been prepared by an important user, and outstanding developments are looked for during the coming year. One United States company, as mentioned by Dr. Fink, already has produced a commercial electrogalvanized wire.

The Continental Steel Corpn., Kokomo, Ind., has put into operation during the year a new type of hot

dipped galvanizing of wire which the company describes as follows: "After annealing, the wire is put through a thorough cleaning in hydrochloric acid, then is washed in water, fluxed in a zinc chloride solution and dried. After this it enters the bath of molten zinc. Up to this point the process follows usual good practice in hot galvanizing. After the wire leaves the molten zinc galvanizing bath it passes through a nickel coating regulator which regulates the amount of coating carried by the wire and then passes on through a controlled flame which evens and smooths the coating around the wire and closes up any voids or pinholes." The process is now in commercial production at the company's Kokomo plant.

Plant Processes

THE finish of a stamped metal product is determined to a large extent by the finish of the dies, and Ampco Metal, Inc., Milwaukee, has given exhaustive study to this phase of metal finishing. Many automobile parts are now being fabricated without the need of final polishing by use of highly polished dies made of this company's new bronze. This material has a Brinell hardness ranging up to 340 which is not as high as die steel, yet records indicate longer life due to the fact that the alloy will not "pick up" the stock passing through the die. In the forming of automobile frames the bronze alloy of the dies is backed with steel. Some of the items said to have a better finish when produced with dies of this special bronze are, refrigerator panels, ice cube trays, tantalum wire, and prelacquered trays.

Much study has been directed to burnishing problems during the year and as a result the process has taken on new dignity and bids fair to compete in some cases with polishing as a pre-plating operation. By using a special irregular-shaped burnishing agent one company successfully substituted tumbling barrels for buffing wheels in preparing safety razor handles for the nickel plate bath.

The Globe Machine and Stamping Co., Cleveland, developed new burnishing equipment during the year, including a tilting tumbling barrel which they claim is engineered as a machine tool. A feature of the new barrel is a triple action shifting bottom which is said to reduce the operating time and to give a more uniform quality to the work.

European Developments

ELECTROCLEANING in combination with hot galvanizing of wire reached the commercial stage in Germany in 1934 with the 16-wire installation at the Gutehoffnungshuette plant in Gelsen Kirchen. In this installation, which was that of the Langbein-Pfanhauser-Werke, it is claimed that cyanide fumes are eliminated, that costs are reduced, and that the galvanizing itself is fully equal to the more expensively processed hot galvanized wire such as that produced in this country.

Another European development of the year was a process whereby aluminum powder is spread over the zinc bath in galvanizing. It is claimed that this prevents oxidizing of the zinc and that it creates a silvery finish on the galvanized products. A new process for applying nickel directly to steel is reported. This consists of surrounding complicated steel parts with nickel dust and then heating until fusion takes place. The nickel melts first and is said to form a firm bond with the steel in much the same way that nickel bonds with steel in the nickel-clad process in this country.

A method of coloring aluminum by using oxalic acid instead of chromic acid is reported as a commercial process in Europe. The result is said to be similar to that secured in this country.

The Lead Industries Association reports that in England anodes made of antimonial lead containing tellurium are now being used successfully in chromium plating.

The U. S. Galvanizing & Plating Equipment Corpn. has obtained the exclusive rights in the United States and Canada for a bright nickel plating process from Langbein-Pfanhauser-Werke, Leipzig, Germany. This process is said to make possible a nickel deposit of high brilliance, irrespective of thickness of coating, thus eliminating the necessity of subsequent polishing or color buffing.

Year-End Statements Reflect Growing Confidence in 1935

INCREASING confidence in 1935 industrial activity is reflected in the year-end statements of many prominent executives in the metal-working industry. "The outlook for the steel industry," said Walter S. Tower, executive secretary, American Iron and Steel Institute, "appears to be somewhat more favorable than it was a year ago. The extent of improvement actually realized, however, will be influenced largely by the degree of success attained in the efforts to get cooperation among all interested parties including legislators, administrative officials and business leaders."

"Business and Government," said A. W. Robertson, chairman, Westinghouse Electric & Mfg. Co., "are beginning to pull together. The load is starting to move. As these two forces learn to work in harmony under the new conditions, marked improvement in economic conditions may be expected. The fall business of electric manufacturers was the best in three years. Prospects for next year are good."

The automobile industry should exceed its last year's performance, according to E. T. Weir, chairman, National Steel Corpn., and there is hope that the railroads will be able to solve their difficulties and become larger consumers of steel. "Reasonable success of the housing program," Mr. Weir continued, "undoubtedly would reopen a large market for steel and have a buoyant effect upon general business conditions."

"All signs point to a substantial revival in the heavy industries in 1935," said Albert C. Lehman, president, Blaw-Knox Co. "More than $5,000,000,000 worth of industrial machinery and power plant equipment must be bought to make good deferred maintenance, according to estimates of the Durable Goods Industries Committee."

Application of Wear-Resistant Alloys

PROBABLY one of the greatest problems encountered in the iron and steel industry is that of abrasion. The clash of steel on steel as shears clip off the end of a bar, or punches smash their way through plate, may be music to the production man, but it is an alarm bell to the maintenance and repair department. Steel parts clashing or even rubbing together, especially at red heat, means abrasion that either rapidly or slowly wears away metal until its usefulness is impaired and replacement becomes necessary.

Why do some materials wear longer than others? The answer to this question involves only an elementary understanding of the mechanics of wear. It is hardly necessary to state that friction is never present without the accompanying generation of heat.

Surface Temperatures High

But what is less generally understood is that even under conditions of moderate abrasive wear, surface temperatures are unbelievably high, and that under severe abrasive conditions they often approach momentarily a red heat even though there may be little evidence of such high temperatures to the eye because of the dissipation of the heat into the body of the metal.

An experiment using a pyrometer shows that if the exposed end of a thermocouple is held against a rotating steel disk, a temperature of 1500 deg. F. will be generated on the surface in contact. It has also been calculated that if two polished steel surfaces at room temperature are pressed together with a force of 100 lb. per sq. in., and moved against each other at the rate of 1 in. per sec., the metal will be heated to above 1200 deg. F. for a depth of one ten thousandth of an inch. Although 0.0001 in. may seem to be negligible, actually it contains thousands of layers of molecules or grains. If the metal is one which softens at red heat, it will wear away rapidly, since successive layers of the metal will be quickly exposed to the heating and wearing action.

Since, as a general rule, harder alloys will wear less rapidly than softer ones, a consideration of these facts indicates that to resist wear successfully a material must be hard at those high surface temperatures at which

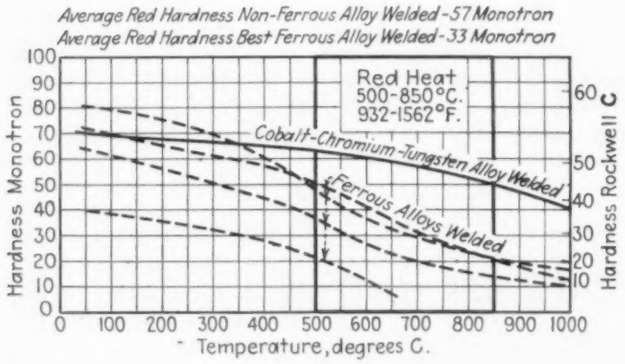

Average Red Hardness Non-Ferrous Alloy Welded - 57 Monotron
Average Red Hardness Best Ferrous Alloy Welded - 33 Monotron
Red Heat
500-850°C.
932-1562°F.
Cobalt-Chromium-Tungsten Alloy Welded
Ferrous Alloys Welded
Hardness Monotron
Hardness Rockwell C
Temperature, degrees C.
0 100 200 300 400 500 600 700 800 900 1000
0 10 20 30 40 50 60 70 80 90 100
10 20 30 40 50 60

FIG. 1—Chart showing the red hardness of the non-ferrous alloys of cobalt, chromium and tungsten compared with four high-iron alloys.

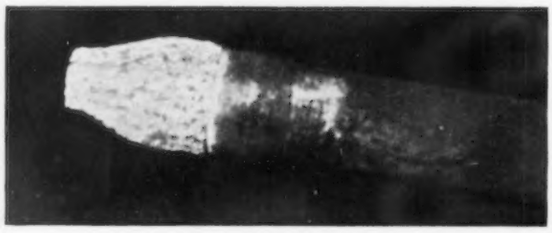


FIG. 2—The life of this water-cooled poker has been increased from three months to more than two years by hard-facing.

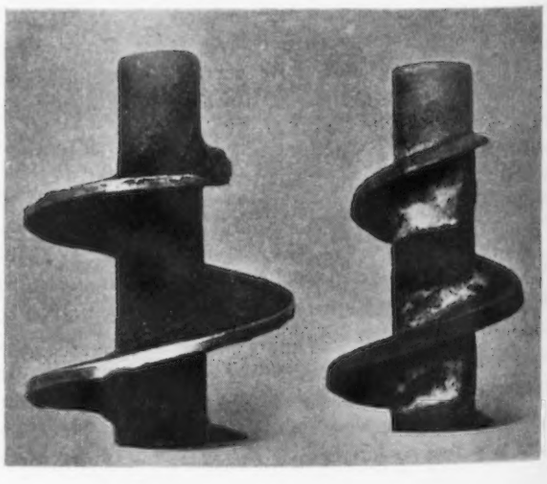


FIG. 3—On the left is a hard-faced mud gun screw after four months' service. On the right, an ordinary screw after one month of service.

To Steel Mill Equipment

By E. E. LE VAN
Haynes Stellite Co.
Kokomo, Ind.

GROWING use of hard facing—the process of welding on to wearing parts a coating, edge or point of a metal highly resistant to abrasion—has included iron and steel applications, a number of which are described and illustrated in this abstract of Mr. Le Van's paper before the recent annual convention of the International Acetylene Association.

the maximum wear takes place. This important property has been termed "red-hardness," or the ability of an alloy to remain hard at red heat. Therefore, it is red-hardness and not cold-hardness which determines the true ability of an alloy to resist wear.

Wearing Surfaces Protected by Hard Facing

Fortunately, most wear is localized to such an extent that the actual wearing surfaces can be protected against abrasion simply by welding on a thin layer of hard-facing material. Thus, the bulk of the part may be made of anything from a mild steel to tough and strong alloy steels and a hard-facing alloy applied to those surfaces taking the brunt of the wear. In this manner it is possible to utilize the strength and toughness of the steel in the body of the part and the abrasion-resisting qualities of the hard-faced surface.

Hard facing may be defined as the process of welding on to wearing parts a coating, edge or point of a metal highly resistant to abrasion. Depending on the type of hard-facing alloy used and the service to which it is subjected, hard-faced surfaces will outlast steel from two to 25 times. As a rule, wearing parts are not hard-faced until they are worn in service, but the hard-facing process is applied equally well to new parts before they are installed. In addition to longer life of equipment, other cost-reducing features of the hard-facing process are: Fewer replacements and uninterrupted production with resultant savings in labor charges and in lost time for shutdowns, salvaging of worn parts from the scrap heap, savings in power, and a general increase in operating efficiency.

Three Groups of Hard-Facing Materials

Selection of the proper hard-facing material for a given job is of considerable importance, especially as these materials cover a wide range of strength, hardness, wear resistance and weldability. There are three general groups of hard-facing materials, one of which is essentially nothing more than high-alloy steels having considerable strength and toughness and comparatively mild resistance to abrasion. Materials of this group are used primarily for hard-facing gyratory crusher mantles, crusher jaws, dipper teeth and similar parts subjected to severe shock and impact, giving the rebuilt parts at least twice their usual life at only a fraction of the cost of new parts.

Another class consists of the tungsten carbides, the so-called diamond substitutes, which cannot be applied like welding rods by melting in the oxy-acetylene flame and are, therefore, used in cast pieces of various sizes which are held in place by a binding material. Though of only minor importance to the steel industry, the diamond substitutes have found widespread use for hard-facing oil well drilling tools. Today only 14 drilling bits hard-set with tungsten carbide are necessary to complete a well at Pierce Junction, Texas, whereas less than 10 years ago 84 bits were required to drill through the same formation to the same depth.

Red-Hard Non-Ferrous Alloys

The third class consists of the red-hard non-ferrous alloys of cobalt, chromium and tungsten. These are most important to the steel industry, because of the high temperatures of many of the operations in that industry. To obtain maximum efficiency and greatly increased life under these

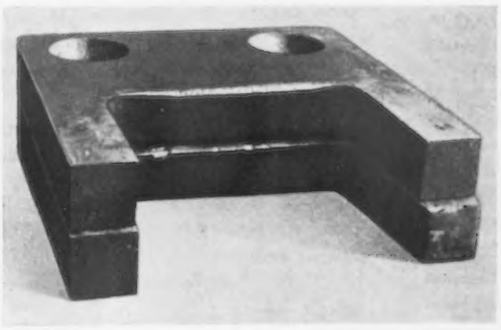


FIG. 5—Hard-faced shear knife after 50 heats (lower) and plain steel knife after six heats.

FIG. 4—This hard-faced tap hole auger drilled 17 holes before resharpening became necessary.

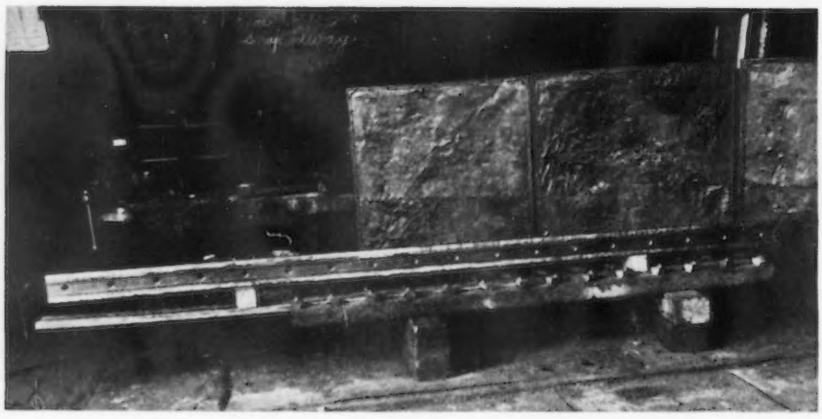


FIG. 6—This hard-faced shear blade lasts two to three times longer between grinds than the hardened steel blade formerly used.

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severe conditions, it is essential to hard-face wearing parts with an abrasion-resistant alloy that will maintain its hardness at the elevated temperatures.

While all alloys soften to some degree when heated to the red range, the rate of softening varies greatly. The addition of alloying elements to steel considerably raises the range at which it would soften, but no alloy containing appreciable percentages of iron is truly red-hard because iron at a red heat has the property of dissolving the hardening constituents. Cobalt, substituted for iron as the base of the non-ferrous cobalt-chromium-tungsten alloys, does not dissolve the hardening constituents until the alloy is heated almost to the melting point. Fig. 1 shows the red hardness of the non-ferrous alloys of cobalt, chromium and tungsten and four high-iron alloys. The red-hardness range is noted by the rectangular block indicating temperatures from 500 to 850 deg. C. (932 to 1562 deg. F.). All of these metals were tested after they had been welded on to steel. It will be noticed that the non-ferrous alloys of cobalt, chromium and tungsten have an average hardness of 57 Monotron as compared to 33 for the best of the iron-base alloys. The superiority in hardness at a red heat is, therefore, about 75 per cent, which accounts for the fact that the non-ferrous alloys give such excellent results in resisting abrasive wear.

Besides red-hardness and abrasion resistance, other valuable characteristics of the non-ferrous hard-facing alloys are their excellent welding properties and their low coefficient of friction. The latter is of considerable importance since with less friction, less surface heat is developed in contacting parts. For example, rapid wear made it necessary to replace a steel shaft every week and the bearing in which it turned, every two weeks. Hard-facing the shaft with non-ferrous alloy not only increased the life of the shaft, but also increased the life of the plain steel bearing five times. Wherever lubrication is impossible or unreliable, or for conditions of severe abrasion, the use of non-ferrous hard-facing materials has proved highly economical.

Typical Steel Mill Applications

Today there are literally thousands of hard-faced wearing parts in practically every industry. Of the scores of steel mill applications, it will be impossible here to do more than show a few typical examples of hard-facing procedures and the economies resulting from them.

Application of a wear-resistant alloy to a water-cooled poker is illustrated in Fig. 2. A steel company in the Pittsburgh district has standardized on this hard-facing application after results showed that the hard-faced poker did not require replacement after two years of service. These pokers are subjected to such severe heat and abrasion that the life of an ordinary 8-in. diameter steel poker is only about three months.

The hard-faced electric mud gun screw shown at the left in Fig. 3 is still good after four months' service at a blast furnace located in Cleveland. The ordinary screw on the right shows the amount of wear which takes place after only a month's service, at which time replacement is necessary. In addition to hard-facing the screw, the nozzle also has pads of wear-resistant alloy which act as a bearing for the discharge end of the screw, preventing excessive wear of the bore.

Tap hole augers such as shown in Fig. 4 last approximately six times longer when hard-faced. This auger drilled 17 holes before resharpening was necessary; whereas, hardened steel augers had to be resharpened after drilling only three holes.

Gag Press Hammers Hard-Faced

Hard-facing gag press hammers is an outstanding application at a midwestern steel mill. The two sizes of hammers commonly used are 10 in. wide by 42 in. long, and 6½ in. wide by 30 in. long. Four grooves 3/16 in. deep and 1¼ in. wide are machined lengthwise in the larger hammer and three grooves of the same size are machined in the smaller one. Hard-facing rod is then deposited in the grooves and built up flush with the face of the hammer. At this plant, hard-faced hammers outlast plain forged steel hammers 10 to 1 and, of course, the hard-facing application can be repeated several times.

At another steel mill the forged steel hammers formerly used on the gag press would burn away 1/64 in. at each contact and had to be replaced with new ones every six days. These hammers are 8 in. wide and 30 in. high and are now being hard-faced with pads of wear-resistant alloy 3/16 in. thick and 1 in. wide. The hard-faced hammers have run for 90 days, making a life ratio of 15 to 1 over the steel, a remarkable saving in upkeep and an important factor in continuous production.

Two top flying shear knives used at a Chicago steel mill to shear 4-in.

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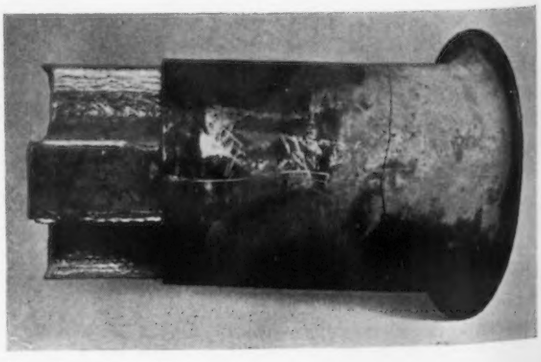

FIG. 7—Hard-facing this spindle for a 24-in. mill resulted in marked lengthening of its life.

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red hot alloy steel billets are pictured in Fig. 5. The lower knife, which was hard-faced, sheared 50 heats of billets and then was quickly reconditioned by applying a little more hard-facing material and resharpening. The plain steel knife, shown above it, was good for only six heats.

The abrasion-resisting qualities of these non-ferrous alloys are also well illustrated in the application of this material to stationary blades for hot shearing squares and rounds at an eastern factory. One hundred kegs of 1⅛-in. square nuts is the average production of regular steel blades as compared with an average of 1500 kegs with hard-faced shears.

Fig. 6 shows a shear blade 1¼ in. thick by 6 in. wide by 13 ft. long used for cold shearing ⅛-in. sheets at an Indiana steel plant. The cobalt-chromium-tungsten alloy is applied with the oxy-acetylene blowpipe to the four corners of the blade. One of these blades has been in use for more than a year and a half and is still on the job. This company also reports that the hard-faced blade lasts from two to three times longer between grinds than hardened steel formerly used.

Parts of tin plate coating machinery at a large sheet and tin plate mill have been hard-faced with decided economy. The bearing end of the driving gear on the top roll of the tinning machine is subjected to severe pressure and suffers from lack of lubrication due to heat and from attack of acid from the flux, necessitating its removal every six days to have the bearing turned down and a new journal box fitted. Hard-facing this bearing makes it last for the life of the roll, and this method is now standard practice at this plant.

Hard Facing Applied to Spindles and Guides

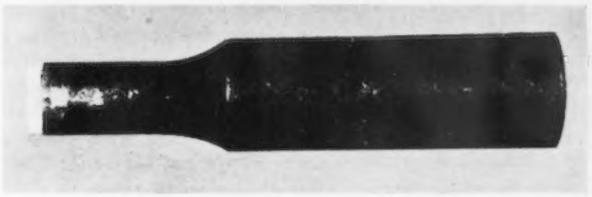
Application of hard facing to the spindle for a 24-in. mill (Fig. 7) at a Cleveland steel plant resulted in greatly lengthening its life. This spindle was hard-faced on each end and both sides of the pad with a ⅛-in. layer of wear-resistant material. In addition to greatly increased life, a saving in gears is accomplished because the lash in the boxes is reduced. Another company has effected considerable economy by hard-facing reversible blooming mill drive spindles. These are built up on all eight faces with approximately 26 lb. of a hard-facing alloy.

One of the greatest savings that hard facing has effected in the iron and steel industry has been on the different guides used in the rolling mill. In one large mill a cast steel guide on the first finishing operation of the rail mill had to be changed every seven days and, after the first shift, had to be reground every three hours. A hard-faced guide on this operation has run 10 weeks without change. Not only has this been a big saving through reduction of time lost in changing guides, but the percentage of scrap and seconds has been considerably reduced. Merchant mills have had equally good results with hard-faced guides and in some instances have reduced their guide inventory to one-sixth.

In another steel plant, hard-faced entry guides on the diamond pass No. 4 and No. 6 stands of the continuous bar and billet mills have shown a life of 6 to 1 over steel guides. This has resulted in reducing the inventory of guides from 500 to 100.

The life of side guides has been increased from an average of one week for plain steel castings to several months for hard-faced guides in the rail mill of an Ohio steel company. These guides are approximately 2 in. wide and 30 in. long and a layer of hard-facing alloy is deposited ⅛ in. thick on the entire width and almost to the point of the guide. Hard-facing of wobblers on rolls and pinions is also proving economical.

Another steel company is now hard-facing all the guides in the rail mill. Some of the guides are quite large and require 4 to 5 lb. of the non-ferrous hard-facing material. It is reported that in many cases the hard-faced guides have shown a performance ratio of 50 to 1 over any other guide material thus far tested. This has resulted in remarkable savings because of freedom from shut-downs for changing guides.



ABOVE

FIG. 8—This punch is still good after hot punching more than 1600 holes in 1 in. thick carbon-steel plate.

AT RIGHT

FIG. 9—Hard-facing a 9-in. valve disk for high-temperature, high-pressure steam service.

Hot Punches 1634 Holes in 1-In. Carbon Steel Plate

Punches and dies are another important hard-facing application. The punch shown in Fig. 8 is still as good as new after hot punching 1634 holes in 1 in. thick carbon-steel plate. The ordinary steel punches formerly used averaged only 800 holes. One of the large manufacturers of steel car wheels is now blanking the center hole of forged-steel wheels at a temperature of 2000 deg. F. The hub

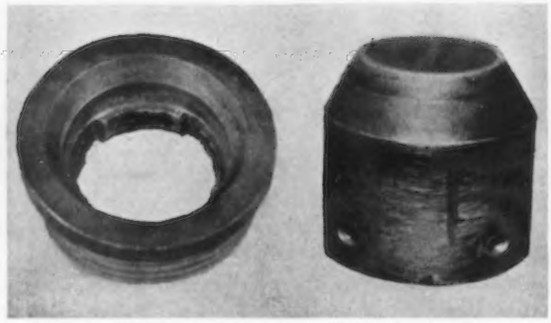


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FIG. 10—Seat ring and disk after 14 months' service on a 460-lb. super-heater line. When removed the valve was tight and the hard-faced surfaces showed no indication of scoring.

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of this wheel is 8 in. through and the hole punched is 4¾ in. in diameter. The cast iron punch formerly used had a life of three to 10 holes before being replaced. A carbon-steel punch with a hard-faced cutting edge punches from 100 to 160 holes. After the punch has been forced through the hot metal, it is released from the plunger or ram and allowed to fall to the floor instead of being drawn back through the hole. Another advantage of the hard-faced punch, in addition to its longer life, is that it leaves a cleaner hole. Only one roughing cut is required when machining the wheel, whereas previously it was necessary to take two and sometimes three cuts. This has reduced the cost of machining about 40 per cent.

Diagonal rolls have also been successfully hard-faced, results at a Pennsylvania steel mill indicating an increase in life of at least four times over that of the plain rolls. These rolls are subjected to severe abrasion at the point where the flanges of the beam dig into the roll. At these points, a recess is machined approximately 3/16 in. deep in which hard-facing rod is deposited and built up flush with the surface of the roll.

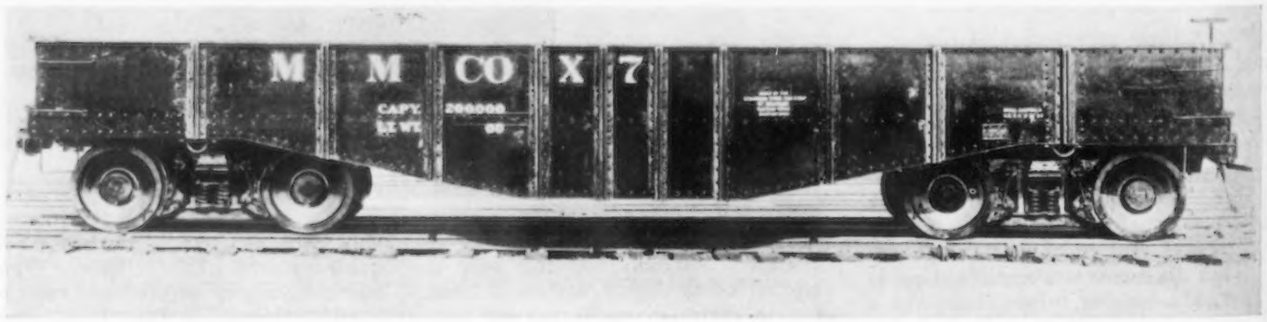
Another Pennsylvania steel company has found rebuilding sleeve gears for driving edging rolls with hard-facing material to be particularly economical.

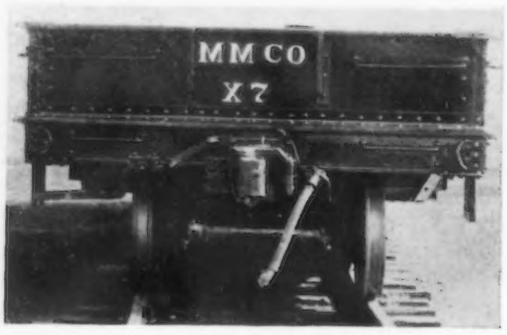
At an Alabama steel plant, the hard-facing of conveyor rolls and shaft bearings used in heating furnaces is working out well. These rolls operate at 750 deg. F., and it is impossible to lubricate the bearings. After 30 days' service, the first bearings hard-faced have shown no signs of wear.

High-Temperature Steam Valves Hard-Faced

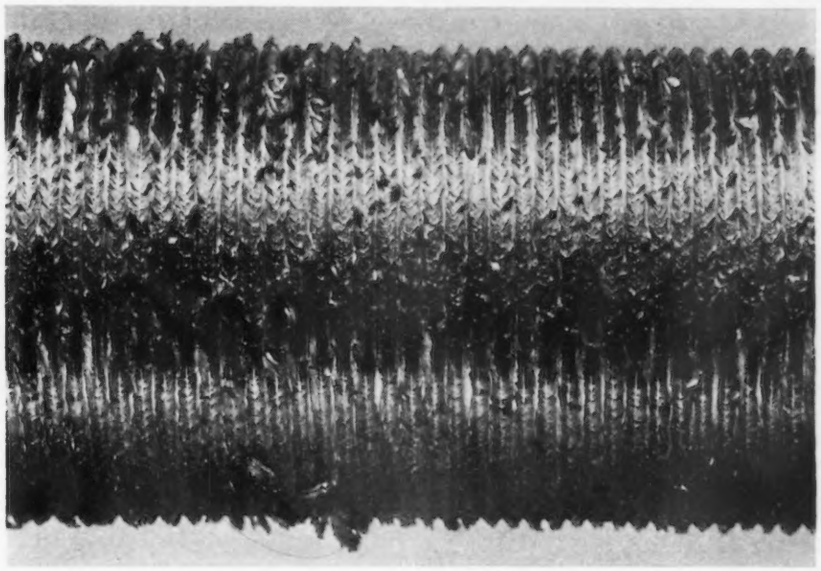
A recent development which promises to effect widespread economies in practically every industry is the hard-facing of gate and globe valves for high-temperature high-pressure steam service. Fig. 9 shows the application of hard-facing alloy to a 9-in. valve disk. The non-ferrous alloys of cobalt, chromium and tungsten are not only non-galling and resistant to wire drawing, but are also resistant to corrosion and erosion and, because of their red hardness, are particularly adaptable for this type of service. Gate and globe valve seats and disks faced with these non-ferrous alloys outlast usual seating materials six to 10 times.

Fig. 10, a reproduction of an unretouched photograph, shows the excellent condition of a ¾-in. seat ring and disk after 14 months' service on a 460-lb. super-heater line. When removed, the valve was as tight as ever and the hard-faced surfaces showed no indication of scoring or wire drawing. Seating materials previously used lasted only a month. This performance record is all the more significant when it is considered that the valve was used for drip service—which is most severe in its action on valve seats and disks.





GONDOLA car using Timken-equipped inboard type trucks built by the Standard Steel Car Corpn., Canton works, for the Mesta Machine Co., Pittsburgh. The advantages claimed for the Timken inboard type truck for industrial and steel mill plant service are as follows: A considerable amount of weight is saved which reduces the cost of truck; outside journal boxes are eliminated which removes danger from striking obstructions along the track; axle and bearings are inclosed in solid housing and bearings operate in oil bath; the inboard construction provides stability and eliminates the derailment hazard.



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THE best way to prepare a machine element for coating by metal spraying, or "Metallizing," is to rough machine it with a V-shaped tool. Loose chips should be removed, of course, before the spray is applied.

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Coating Machine Elements By Metal Spraying

By CHARLES BOYDEN

Chief Engineer, Metallizing Co. of America
Los Angeles, Calif.

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"METALLIZING," or metal spray coating of machine elements, is really a business within itself, and the perfecting of this type of coating is of tremendous importance in practically all engineering fields. Quick, permanent and inexpensive repairs can now be made which heretofore were in many cases quite impossible. Repairs which necessitated the dismantling of massive machinery and took weeks to accomplish can now be done in a few days at a very low cost and without the necessity of completely tearing down the machinery in question. Small pieces as well as large pieces offer the same possibilities, and of particular interest is the reclaiming or salvaging of obsolete parts; those which the manufacturer has discontinued making.

This type of coating is by no means limited to simple repairs. Sleeves of metals resistant to various types of corrosion can be sprayed in the center of ordinary shafting, doing away with the necessity of buying a complete shaft of some expensive material when only a few inches of the shaft are subjected to corrosion. Hard surfaces can be applied to soft surfaces, and softer surfaces can be applied to harder bases. It taxes the imagination to conceive of the various possibilities.

COATING or rebuilding of worn or corroded surfaces of machine elements through metal spraying has met with much success during the past two or three years.. Where failures have been encountered, it is chiefly, in the opinion of the author, because of improper preparation. In this article, he tells how to prepare the work so that failure will be next to impossible.

It is only in the last two or three years, however, that complete success has attended the efforts made to develop this kind of metallizing. Early attempts were as a rule failures, and coatings which stood up were the exception and not the rule. But today failures are quite uncommon, and such failures as are of record can be traced to some peculiar circumstance con-

nected with those particular applications, or to the improper preparation of the surface being coated.

About 80 per cent of the success of any metal sprayed coating depends upon the surface preparation, and this holds true whether the surface be flat or of a circular nature, such as a shaft. It is generally understood that the preparation of a surface to receive a metal sprayed coating is best accomplished by blasting with steel grit or sand, and this is correct where large surfaces are to be coated. But in machine element work, where as a rule there is considerable stress or shock, a more positive bond is required and other methods should be used in preparing the surface.

Preparation by Machining

Now, in machine element work it will be found that most surfaces are of a circular nature, such as shafting, pistons, etc., but occasionally it is necessary to coat a flat or semi-flat surface, and in either case the surface should be prepared by machining whenever possible. A coating applied to a properly machined surface has a bond strength that is amazingly high and such a coating can be relied upon to give most satisfactory service even under adverse or severe conditions.

Inasmuch as most surfaces to be coated will be of a circular nature a shaft has been taken as the subject of this discussion and, furthermore, a shaft will better illustrate the essential points of machine element preparation.

A Hypothetical Case

In any coating work the first thing to consider is the purpose of the coating. Is the shaft undersize and what will be the finished size? Is the coating to resist wear primarily or is it's resistance to corrosion of great importance? Is grinding equipment available or must the coating be machined? In other words, what kind of a coating can we apply and how can we finish it?

A Stainless Steel Coating

We will assume that the normal diameter of the shaft is 1½ in. and there is a section about 6 in. long which is corroded and about 0.040 in. (on the diameter) undersize at this point. The conditions are such that stainless steel seems best suited for the coating, and as grinding facilities are available we will finish by grinding.

Now on a shaft of this diameter the coating should be at least 0.030 in. thick over the top of the threads, but in running the threads on the shaft prior to coating, the tops of the threads will lift up a little, so we had better allow for that and take off 0.040 in. on a side or 0.080 in. on the diameter. The corroded section being 6 in. long we will allow an inch at each end and make the cut 8 in. long. The net result being then, as the first step of preparation, a section 8 in. long machined 0.080 in. undersize.

Quite often as an extra precaution, it is advisable to make a dovetail undercut at each end of the undersize section, as this eliminates any possibility of the coating splitting at the end. This safety measure is not absolutely necessary, but it only takes a few minutes to do it and may save trouble further on. This is done before threading.

The Threading Tool

The threading tool must be ground so that it will have a sharp V point (looking at the tool from the top) and the point should be practically straight, up and down (looking at the tool from the side). The tool should be mounted in a good husky holder so it is rigidly held up to the work, and it should be set so that the top of the tool is below the axis of the shaft as the work rotates toward the mechanic. The setting of the tool is of major importance and its position is best determined by trial on a sample piece. The way it is ground will have an influence on its setting and no fixed rule can be laid down for grinding or setting. But the main idea is to scrape or drag a thread instead of cutting one, in fact to sort of tear a thread along the surface of the work.

The number of threads to the inch will vary with the nature of the work and also with the diameter of the piece. On a shaft of 1½ in. diameter about 18 threads per inch will be satisfactory. On a larger shaft we would want to use 16 threads to the inch and on a small shaft as many as 24 to the inch. It is unnecessary to go to more than 24 threads, and only on exceptionally large pieces will there be any advantage in using less than 16 to the inch. But the main idea in all cases is to make a rough thread. A thread that is torn, that has barbs on the side, that under a magnifying glass of 100 diameters or more will show minute fissures on the surface, can be depended upon to give a real bond.

The threading operation will require but one "cut." For best results the work should rotate slowly. The tool should be fed into the shaft to a full thread depth and the threading operation completed in one traverse of the threading tool.

Knocking Off the Loose Pieces

After the piece is threaded we will find a number of small pieces have been literally torn off the sides and tops of the threads. Some of these small pieces will be found in the bottom of the threads and some will be found clinging to the top of the threads. Those that are in the bottom need no attention unless large, but those that are on the top should be removed. So now we will use another tool that is ground square at the end (straight across the face), and with the work revolving this tool must be run in until it just misses the top of the threads. This final operation will knock off the pieces attached to the top of the threads, and this having been done the shaft is ready to receive the coating.

The illustration accompanying this story shows a shaft that has been correctly prepared. The shaft used was 1½ in. in diameter, but to better illustrate the important points the photograph was made three times actual size and therefore only part of the shaft shows in the picture. One end of the shaft is finished and ready to receive the coating and the other end is finished up to the final operation of removing the small pieces attached to the threads. Notice carefully the barbs on the sides of the threads. Underneath each one of these little barbs is a crevice for the sprayed metal to lock into. Notice the torn appearance of the surface and that on the left side of the picture, near the top, may be seen some small pieces attached to the threads. This is the way a shaft should look when the surface is properly prepared, and having prepared it this way it will be hard to finish up with an unsatisfactory job as the spraying and grinding is quite simple. But the fact still remains—*80 per cent of the success of the coating depends on the surface preparation.*

Gun Mounting

There is little need to go into any great discussion on coating, as the technique of spraying is more or less the same for any surface. But there is one point which should be mentioned relative to coating machine elements. The "gun" should be so mounted that the spray is directed slightly above or below the axis of the work, dependent on the direction of rotation. The angle should be such that the spray is directed under the barbs on the side of the threads. This

enables the minute metal particles to lodge in the crevices and increase the bond.

The metallizer, as a rule, is mounted on the tool post and fed slowly back and forth, across the rotating surface to be sprayed, by means of the screw feed. The speed of rotation of the work should be regulated to suit the diameter of the piece being sprayed and the traverse speed of the spraying tool will depend on the surface speed of the work. The relation of the two should be such that a good overlap is assured as the coating is applied, and when the coating is exceptionally thick the work should not be allowed to get unduly hot. However, with the machine method of surface preparation there is less danger of having a loose coating if the work piece is allowed to get hotter than usual.

Finishing by Grinding

Sprayed metal coatings are quite unlike solid metal and a grinding wheel that is satisfactory for solid material is not always suited to sprayed coatings. The writer realized about a year ago that an investigation on this point was necessary, and knowing that the best place to get reliable information on this subject was from the manufacturers of grinding equipment he wrote the Norton Co. of Worcester, Mass., and asked them if they would cooperate and run some tests to determine grits, speeds, traverse, etc. This they very kindly consented to do, so some shafts were prepared with high carbon, low carbon and stainless steel coatings and sent on to the Norton laboratories. Their findings were as follows:

Wheels 18 in. x 2 in. x 5 in. Traverse 100 in. per min.

Wheel operating 6000 surface ft. per min.

Work speed 160 r.p.m. for 2-in. dia. shafts.

All grinding done wet.

Wheel recommendations were as follows:

Stainless steel coatings, 3846-K5B-Crystalon.

Stainless steel coatings, 3746-M-Crystalon.

High carbon steel, 46-J5B-Alundum.

Low carbon steel, 46-J5B-Alundum.

Concentration of coolant, one part soluble oil to 40 parts of water.

There is one thing which the writer would like to emphasize, and that is that *all grinding should be done wet.* It may be possible to do dry grinding, but I have yet to see a dry grinding job that was wholly satisfactory or compared in any way with a wet grinding. And there is still another warning to give, and that is to avoid taking heavy cuts. A coating can be burned as easily as solid material, in fact more easily, and the way to avoid this is to take light cuts with the wheel until through experience you learn how heavy a cut can be safely taken.

While grinding is by far the preferable way to finish machine element work, quite often grinding equipment is not available so machining is necessary. With the exception of high carbon coatings, practically any metal sprayed coating can be machined satisfactorily. The principal requirement is that the tools be sharp and kept sharp. Blunt-nosed cutting tools do not work well, as the nature of the coating is such that pointed tools work much better. And in machining the cut should be light. Coatings can be drilled, milled and reamed, but the answer as to the tools is always the same. *The cutting edges must be kept sharp.*

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FOR some years the United States Metal Refining Co., Carteret, N. J., used an oil-fired tilting furnace to melt silver. Around 70,000 oz. could be poured in 13 hr. In order to speed up the work and reduce volatilization losses, this company has adopted high-frequency melting.

The illustration shows an electric furnace melting silver crystals which, after reduction to molten metal, is poured into molds. This unit is rated at 100 kw. and will melt 13,800 oz. for each charge. A saving of 6.2c. per 1000 oz. is certified to by the company, as compared with a fuel-fired furnace.

The silver crystals, as removed from the refining tanks, are washed free of the electrolyte and allowed to drain before charging. However, they are not dried, as it has been found cheaper to charge them moist rather than to interpose a drying process.

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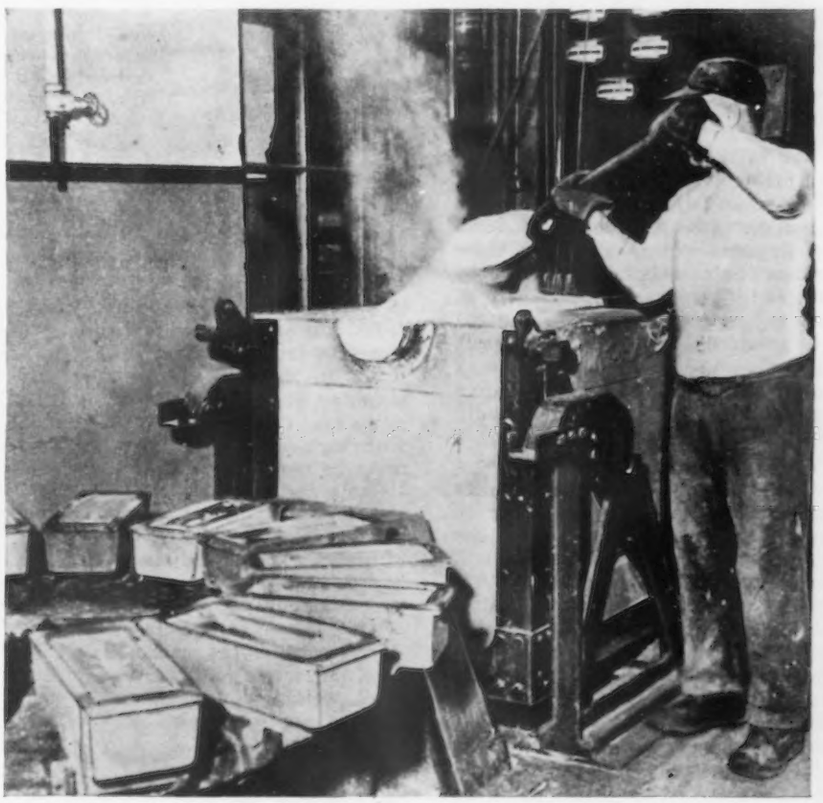
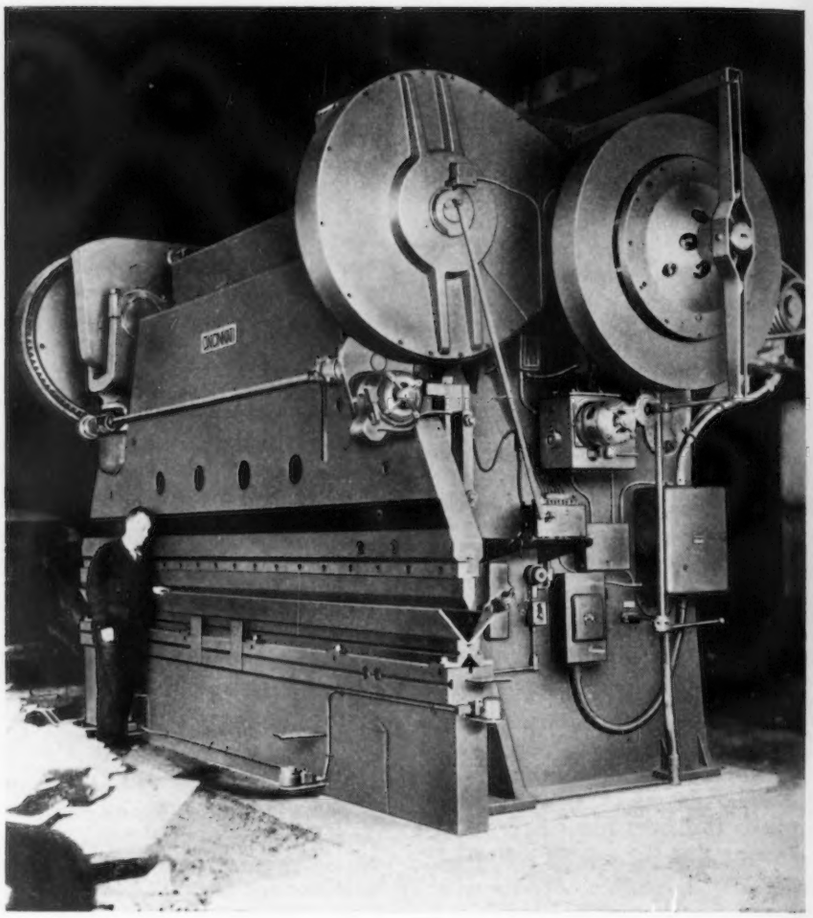


Large Press Brake Bends and Forms Heavy Plate 18 Ft. In Length



ALL-STEEL press brake designed to handle ¾-in. and 1-in. thick steel plate in lengths up to 18 ft. and 12 ft. respectively. Installed recently by the Lukens Steel Co., the machine widens the company's service and also increases the facilities of its Lukenweld division, which fabricates welded steel bases and other structures for the machinery industries.

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DESIGNED to handle steel plate 1 in. thick in lengths up to 12 ft. and plate ¾ in. thick in lengths up to 18 ft., the press brake shown in the accompanying illustrations is believed to be the largest of its type ever built for bending, flanging, forming and multiple punching.

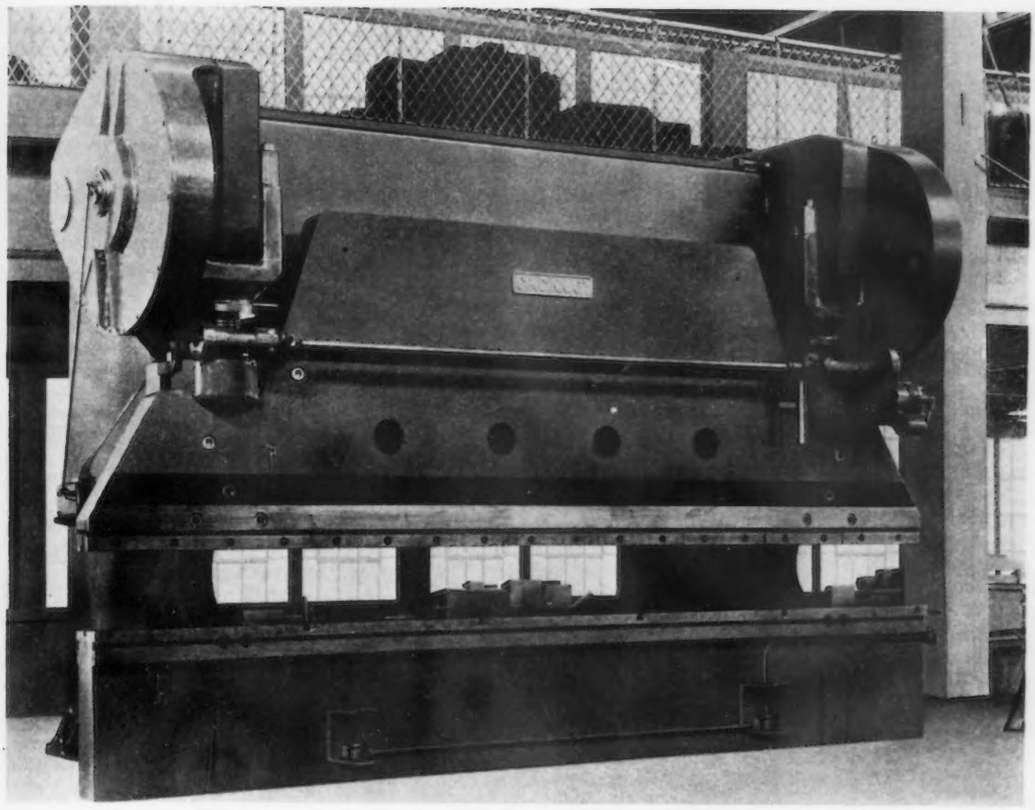
The machine was developed by the Cincinnati Shaper Co., Cincinnati, and has been installed in the By-Products Division of the Lukens Steel Co., Coatesville, Pa. It has a clear distance between the housing of 12 ft. 6 in. with an overall working length of die surface of 18 ft. through a 14 in. throat. The ram has a stroke of 6 in. and an adjustment of 6 in., with a distance of bed to ram, stroke down and adjustment up, of 14 in. Independent adjustment is provided at each end of the ram to take care of fade out or cone work. Two speeds are provided through a gear shift transmission so that the machine may be operated at either five or 20 strokes a minute. The clutch is hydraulically operated and is electrically controlled from conveniently located stations.

One set of five dies gives complete range for general-purpose work on plates varying in thickness from No. 10 gage to 1 in. The machine will develop safe working loads up to 1000 tons. A direct-reading indicator, which can be seen just back of the throat on the right-hand housing, shows the load developed during operation of the press. This indicator has a maximum load hand that records continually the heaviest load to which the machine has been subjected at any time.

The machine is of steel construction throughout, Lukens heavy steel plates of analyses especially adapted to flame-cutting and welding being employed. The housings, flame-cut from two steel plates 8 in. thick, 87 in. wide, and 13 ft. 8 in. long, weigh 33,000 lb. each. The bed and ram were flame-cut from two steel plates 7 in. thick, 72 in. wide, 18 ft. long and weighing 31,000 lb. each. Main drive gears are of welded steel construction, with high-carbon steel providing the requisite tooth strength and wear resistance in the gear rims. The gear guards, which also act as outer auxiliary bearings, are of welded steel construction. The curved rim of the gear guards and the heavy top brace between the housings, which is almost a complete box section in one piece, were formed on the machine itself before they were put in place. The total weight of the machine complete is approximately 145,000 lb.

Interesting design features include use of a divided pitman which, in conjunction with the cylindrical supports for the bed and ram, provides for carrying the load directly on the center line of the housings, thus avoiding eccentric loading. The screw in the pitman is a heat-treated nickel-chromium alloy steel forging cut with a buttress thread, and has a full ball and socket joint, with ball ends hardened and ground. Ram adjustment is accomplished by independent motor through a hardened and ground worm and bronze worm wheel on the screw. In connection with the independent adjustment of each screw, dial indicators show the position of the screw or the ram with relation to the bed and also the position of each screw with reference to the other. Furthermore, for this independent adjustment of each end, pivotal slide bearings have been provided, running on hardened and ground steel guides on the face of the housing, with bronze gibs in the slides. Ram adjusting shaft bearings are of tapered roller type.

Anti-friction bearings are supplied for the steel flywheel, which is 56 in. in diameter, weighs 4000 lb., and runs at 600 r.p.m. The multiple disk clutch is contained in the outer face of the



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USE of a divided pitman in conjunction with the cylindrical supports for the bed and ram provides for carrying the load directly on the center line of the housings. Convenient electrical control is also a feature of this large Cincinnati press brake.

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flywheel. The friction disks are 32 in. in diameter.

The several electrical control stations are arranged with cut-out switches so that the machine may be operated from any one station or may require the operator at each point so push his button as a matter of safety before engaging the clutch. The control further permits operation with the machine making either a complete cycle with the stop at the top, or for continuous running, or for a jogging operation. Automatic lubrication from two stations, one on each housing, is provided. The press brake is driven by a 50-hp. high-torque motor, which drives the flywheel through V-belts.

Improved Rubber Lining Has Glazed Surface

THIS improved rubber lining, for tanks used in processing operations which involve highly corrosive solutions, is announced by the American Hard Rubber Co., 11 Mercer Street, New York. The product is known as M R-10 and is characterized by a high glazed surface which offers greater resistance to acids and alkalies and is easily cleaned. The outer layer of glazed rubber is securely bonded to a relatively thin inner layer of soft rubber, which, in turn, is vulcanized to the steel tank. The soft rubber lamination provides an elastic contact which compensates for contraction and expansion of metal and rubber during changes of temperature. It also acts as a shock absorber to protect the lining against accident and abuse. An added feature is the use of soft rubber fillets in all corners. The lining is a rubber compound which is said to have demonstrated long and efficient service.

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A HIGH glaze surface offers greater resistance to acids and alkalies and provides a rubber tank-lining that is easily cleaned.

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Simplified Practice Recommendations

WASHINGTON, Jan. 4.—The division of simplified practice, Bureau of Standards, has announced that Simplified Practice Recommendation R78-28, iron and steel roofing, has been reaffirmed without change, by the standing committee of the industry.

New Dynamic Balancing Method and Equipment Adapted for Field Use

A NEW balancing method and equipment particularly adaptable to field work was described by E. L. Thearle of the General Electric Research Laboratory at the recent annual meeting of The American Society of Mechanical Engineers.

The balancer is taken to the out-of-balance unit rather than taking the unit to the balancer. The need for such procedure and equipment has become more evident with the increasing installations of large electric units employing large rotating members. In the case of some rotors, such as those of huge turbine generators, no balancing equipment has heretofore been available. In addition to this new equipment, Mr. Thearle has also designed for the General Electric Co. a balancing machine for small rotors on a production basis. In his paper Mr. Thearle described the portable equipment as follows:

The new method deals directly with that component of vibration which occurs at running speed frequency, caused by mass unbalance in the rotating member. This is the only component of vibration which may be eliminated by the addition of balance weights to the rotating mass. The new system and equipment, however, not only greatly simplify the elimination of this component, but also aid markedly in analysis to determine the causes of vibration at other than running frequencies.

Two Generators Employed

The new equipment consists of two special generators, a contactor, and a meter and control box. In practice, one of the generators is attached to each bearing pedestal of the unbalanced machine, the contactor is coupled to the machine's shaft so as to rotate with it, and both generators and contactor plugged into the meter and control box. The special generators are so constructed that they produce an alternating e.m.f. proportional to the velocity of vibration of the pedestals to which they are attached. The contactor has a rotating cam which maintains the contacts closed for 180 deg. and open for the remaining 180 deg. of rotation. The contact assembly, together with a pointer attached to it, can be rotated through a complete circle around the cam. The angular position of the contacts is read opposite the pointer on an annular scale graduated in degrees from 0 to 360. The meter is a highly damped d-c. micro-ammeter arranged with a tumbler switch for connecting it to either generator, and a ratio switch to control its sensitivity.

E.M.F. Proportional to Vibration

Displacement of the pedestal in vibration is sinusoidal and its first derivative, vibration velocity, is also sinusoidal, being zero when displacement is at its maximum and greatest when displacement is zero. Since the generators produce an e.m.f. proportional to vibration velocity, the current through the meter is sinusoidal and proportional to vibration velocity. The circuit through the meter, however, is closed by the contactor during only half a revolution and the meter receives only half a complete cycle of current. It may receive a complete positive half-wave or a complete negative half-wave or complementary fractions of each half-wave. It is thus apparent that the meter will show a reading unless it receives equal fractions of the positive and negative half-waves. Under such conditions, the meter will read zero and the point on the contactor scale halfway between the points at which contact is made and broken will indicate the angular position of maximum vibration displacement. This reading is a measure, accurate to within one degree, of the "phase" of the vibration.

Three complete revolutions of the handwheel which rotates the contact assembly will now move the assembly through exactly 90 deg., at which point the meter receives a full positive or negative half-wave. The meter reading at this point is a reference figure for the magnitude of unbalance.

With the two generators, readings of phase and magnitude of unbalance are readily taken at both ends of the unbalanced machine. It is these data which are essential to a solution of the balancing problem and which the new portable dynamic balancer makes simply and quickly obtainble.

Application of the method using the new equipment is extremely simple—the mathematics having been reduced to a few graphical and arithmetical calculations on a standard data and calculation sheet.

Balance Determination

In placing a machine in balance by the new method, only three balancing runs are necessary. The first run is made with the machine in its normal unbalanced condition and readings of phase and magnitude are taken at the near and far ends. These readings are entered on the standard calculation sheet.

A run is then made with a single known weight of any reasonable amount placed in any position on the near end of the machine rotor. Readings are again taken for the near and far ends and entered on the calculation sheet.

The third run is made in the same manner as the second run but with a known weight of reasonable amount placed in any position on the far end of the rotor.

A series of simple, straightforward calculations are then made on the standard sheet, giving a solution which indicates the values and positions of the final corrective weights which will balance the rotor.

"Skew" Crane Operates At 77-Degree Angle

RECENTLY a 50-ton "skew" type P & H crane was installed in a Fisher body plant by the Harnischfeger Corpn., Milwaukee. The unit is shown on page 42. The plant layout required that the crane be built and installed to travel askew on its runway at an angle of 77 deg., because of a building wall angle, and still function in loading and unloading from cars throughout the building. The unit has a span of 67 ft., and is an 8-wheel type with driving mechanism, truck gears and pinions having miter teeth for traversing the bridge. There is 7-ft. headroom. The trolley is the low overhead type with most of the mechanism suspended between the crane girders.

Custom-Built Monorail Installation

ON page 42 is shown an installation of monorail equipment at the Niles, Ohio, plant of the National Gypsum Co., for handling of large, flat rolled sheets weighing approximately 20 pounds each.

When installed tracks were so erected that the grab and hoist equipment could be used in unloading the sheets from freight cars, in taking fullest advantage of the floor space available for storage, in bringing the sheets to the production line and also, in loading the finished product on motor trucks for delivery.

Switches are so spaced as to divide up the storage floor into just the right areas for maximum capacity. Electrification of the system provides for a one-operator layout.

The pneumatic tire drive featured is said to be a new development. Traction is achieved through pressure of the tire on the underside of the rail. This eliminates peening of rail flanges and wear on track wheels. The improved traction design is in

the interest of less power required to handle a given load.

The special grab equipment is electrically actuated from buttons on the same swivel arm that controls hoist and tractor. This permits the operator to pick up the required load quickly and at reasonable distances.

The steel sheets handled by this installation are fabricated into steel lath. A load consists of 250 sheets and over.

The installation was made by the American Monorail Co., Cleveland.

Moisture Teller Uses Electric Heating Element

A NEW moisture teller for use in sand testing is shown on page 42. The device is manufactured by Harry W. Dietert Co., Detroit, and consists of a cast aluminum base on which is mounted a motor-driven blower which forces air over an electric heating element. The heated air flows through the sand sample which is contained in a pan having a monel metal filter cloth bottom.

The sand is weighed before and after the passage of the heated air; the moisture determination is made in percentages and is said to check exactly with the standard oven moisture affected by condition of the sand. The equipment can be used at any convenient location where electric current is available. No preheating is required. The overall height is 11 in.; the weight is 8½ lb. Any granular material can be tested.

Unique Impact Wrench Tightens or Loosens Nuts

A NEW impact wrench, featuring a unique application of torque blows for either setting or removing nuts is being marketed by the Ingersoll-Rand Co., Phillipsburg, N. J. An action illustration is presented on page 42.

It is said that the tool will spin down a 1-in. or larger nut at 700 r.p.m. and then set it with sharp torsional blows applied at the rate of 1400 per min. The principle of a rubber "accumulator," interposed between the air motor and the chuck, is involved as follows: The accumulator is a cylindrical block of special rubber and, in twisting or when it twists, becomes shortened, lifting the hammer from engagement with the anvil, the hammer is released and spins forward to the next engagement, thus delivering a powerful blow to the anvil, on the end of which the chuck is attached. One man operates the wrench, as shown on page 42. The accumulator absorbs the torque-shock, making it entirely practical, it is said, to operate the equipment from positions which might otherwise be barred from a safety viewpoint.

Nickel-Clad Steel Used For Clean Brine Supply

THE illustration on page 43 shows a nickel-clad steel rock salt dissolver, of welded construction, as supplied under lease by the International Salt Co., Scranton, Pa., to users of its "Isco" rock salt. The top, shell and conical bottom of the unit are nickel-clad steel throughout, with piping and fittings of monel metal. The unit is 48 in. in diameter and capable of producing 200 gallons of pure saturated brine an hour.

Nickel-clad steel is a joint development of the International Nickel Co., and Lukens Steel Co., and is produced at the latter's mills in Coatesville, Pa. It is a hot-rolled bi-metal composed of a light layer of pure, solid nickel permanently bonded to a heavy base of ordinary steel. The pure nickel surface of the bi-metal is said to give all the corrosion-resistance and other advantages of pure, solid nickel with a very considerable saving over construction from solid, corrosion-resistant metals.

Dial Attachment for Hardness Testers

A DIRECT reading Brinell testing attachment has been brought out by the Detroit Testing Machine Co., 5137 Trumbull Avenue, Detroit, and is pictured on page 43. Being independently supported, the attachment is adaptable to all makes of machines; this independent feature is emphasized by the makers as eliminating errors due to deflection or distortion. In operation the tolerance hands are set to the specified limits and the operator has merely to note whether or not the pointer stops between the limits so set.

The device is primarily for use on power driven Brinell machines, but can be used on hand operated machines to advantage in cases where large numbers of similar pieces are to be tested.

Ammonia Liquor Cooler Built in Cast Sections

NATIONAL SECTIONS, manufactured by the National Radiator Corpn., Johnstown, Pa., have recently been used by a large steel company in the construction of the ammonia liquor cooler pictured on page 43, in one of its by-product coke plants. This cooler provides more than 20,000 sq. ft. of effective surface. In addition to occupying less than one-half of the space of the usual pipe coil, these National Sections are said to save approximately 5,000,000 gal. of cooling water per day when operating at capacity. Further economy is effected through the unusually low pressure drop which results in the circulation of fluid through this type of cooler. Other applications in the by-product coke industry are cooling wash oil and condensing light oils and ammonia vapors.

The all-cast iron construction is featured as assuring long service, the cast-iron sections of a wash oil cooler being reported in excellent condition after four years of continuous operation. The efficiency of this design from a heat transfer standpoint is also emphasized.

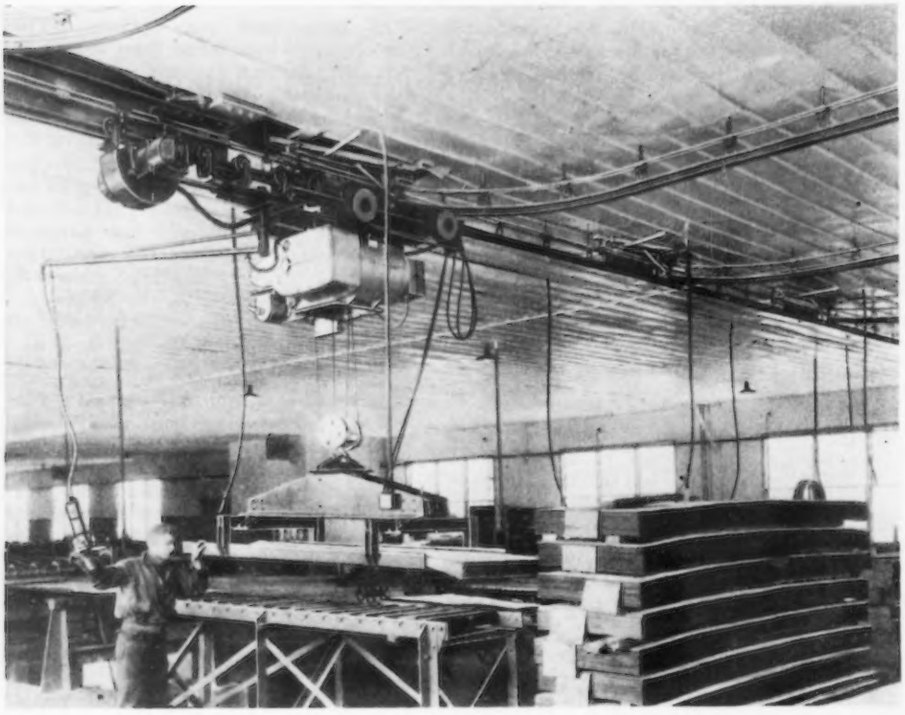
The nature of this product is such that it may be used readily for replacements of pipe coils as well as for new installations.

New Die Head Features Reduced Pull-Off Friction

THE Eastern Machine Screw Corpn., New Haven, Conn., has developed a new insert-chaser die head, No. 101 DM, for use on Brown & Sharpe No. 0, automatic screw machines. The head is pictured on page 43. Adjustable pull-off and head end trips are included in the design. A double-arm, drive shank takes the torque at a maximum distance from the center; this tends to lessen the friction of the pull-off operation. The chasers are identical with those used on other heads made by the company for No. 2 B & S automatics and for ⅞-in. and 1¼-in. multiple-spindle automatics. The capacities of the new head range: 3⅜-in. length of thread on diameters up to ⅜ in., 1 11/16-in. length of thread on diameters up to 9/16 in. and 15/16-in. length of thread on diameters up to ¾ in.

Non-Bleeding Blue-Print Paper and Cloth

THE C. F. Pease Co., 813 North Franklin Street, Chicago, has announced a new Pease "K" blue-print paper and cloth which, it is claimed, will not bleed. This result is said to be attained through a sensitizing solution applied on the surface of the paper or cloth for assurance of a deep blue and a clear white in contrast even in cases of overexposure. It is said that one printing speed will accommodate practically all classes of tracings.



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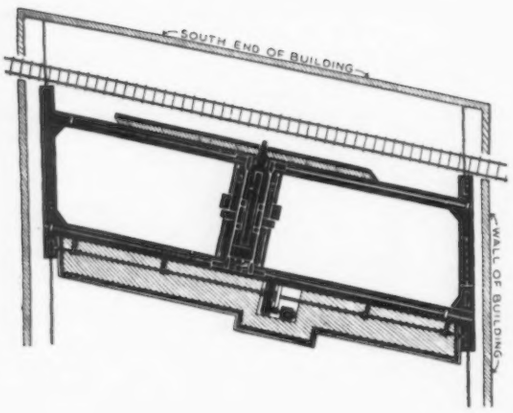
OVERHEAD, pneumatic tire traction is described on page 40 as a feature of new monorail equipment. To convenience of the electric control is attributed wide latitude of grab operation.

BELOW

THIS air operated impact wrench serves to loosen stubborn nuts as well as to spin and set nuts during fabrication or construction. The mechanics of the wrench operation is described on page 41.



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BECAUSE of the peculiar shape of the building in which this crane equipment is used, the crane must travel on its runway at an angle of 77 deg. Additional details of this special installation are covered on page 40.

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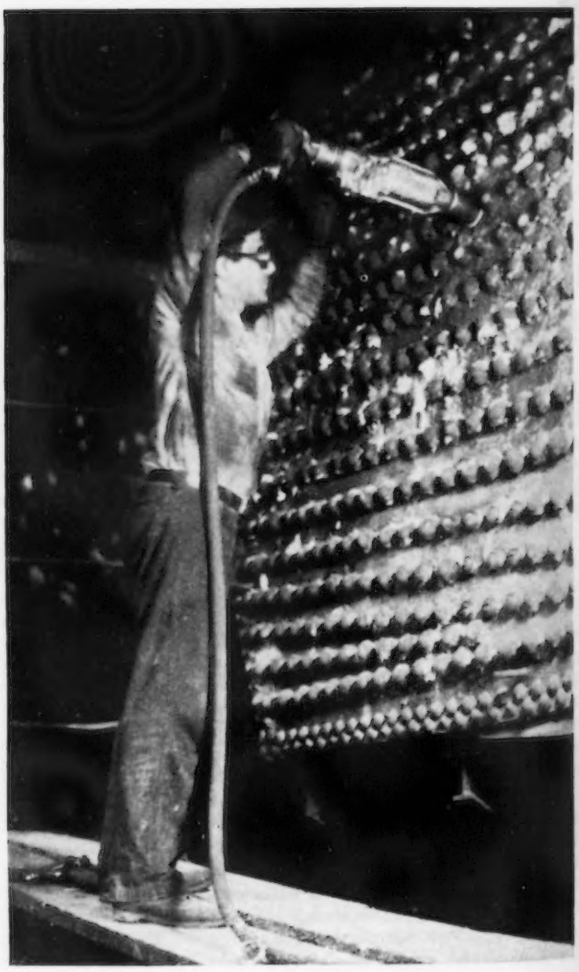
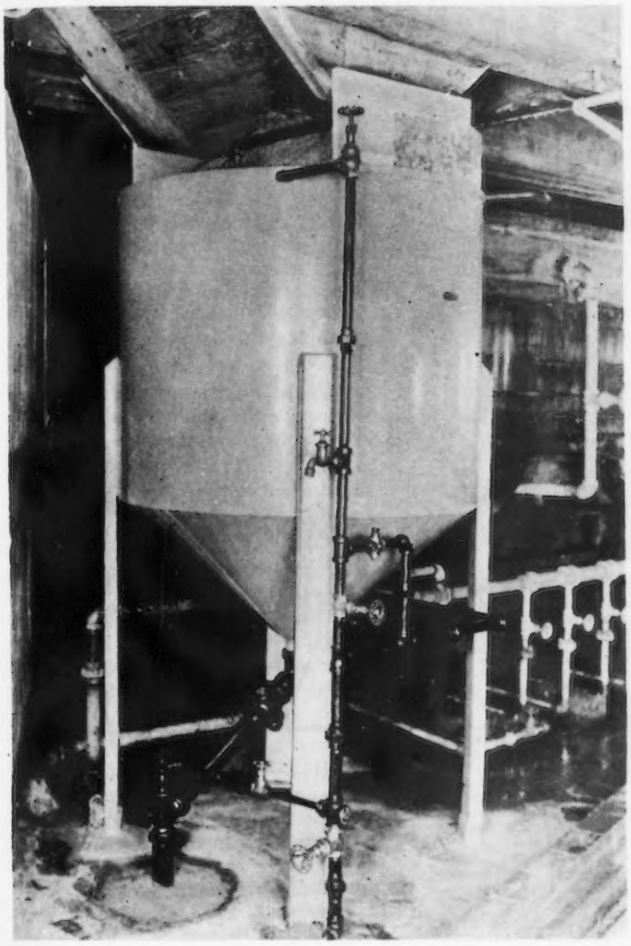
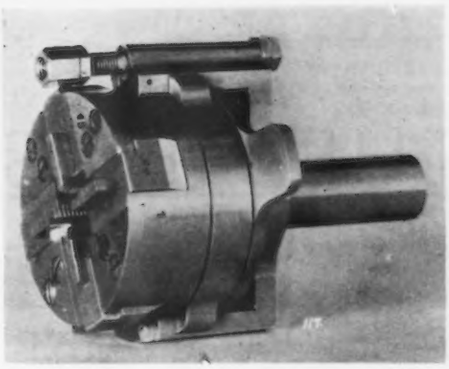
NO pre-heating is required in the use of this moisture teller which forces air over an electrical heating element as described on page 41. Moisture determination may be made of any granular material.

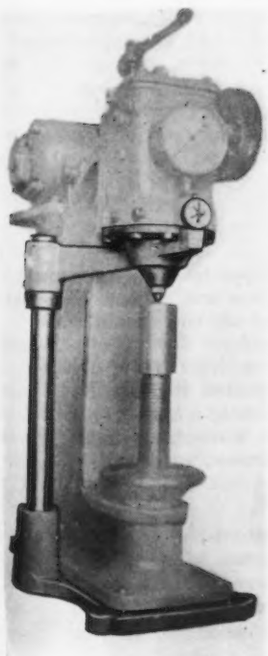




ANOTHER industrial application covering the use of nickel-clad steel is referred to on page 41. This particular case involves a vat layout used in the production of brine.



INEXPENSIVE insert chasers, interchangeable with heads of other sizes, are standard with this new die head which is presented with an improved "double arm drive" shank. The equipment is for use on automatic screw machines as outlined on page 41.



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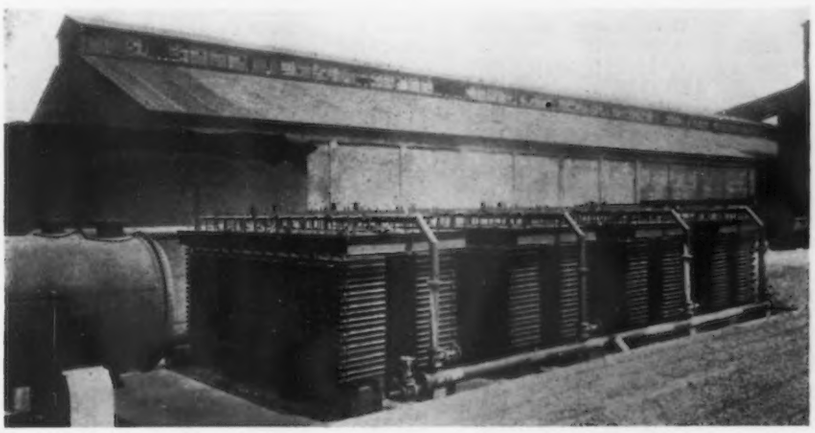
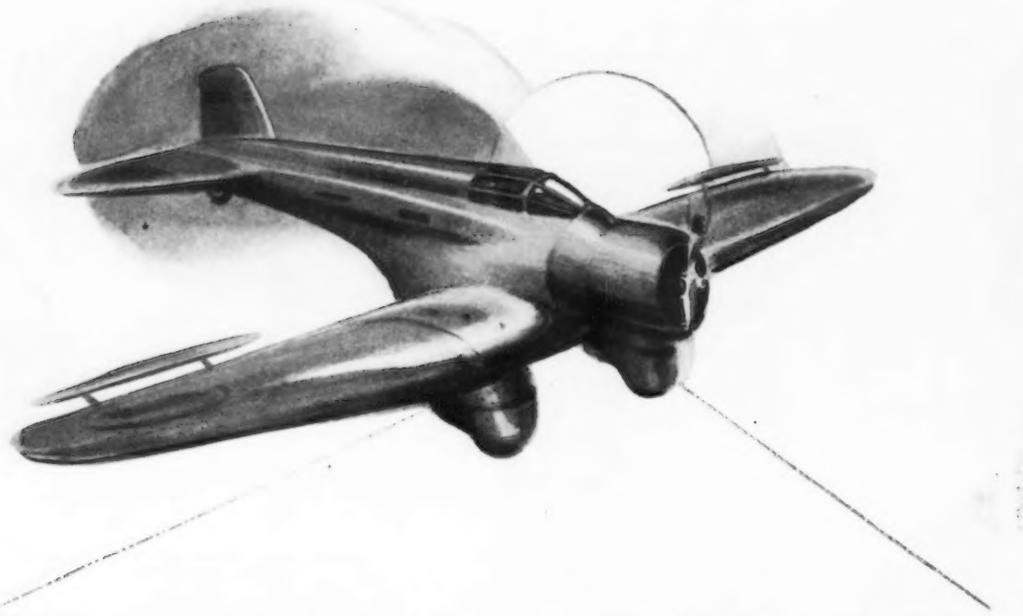
TOLERANCE hands on this dial reading attachment for hardness testers show the limits between which the pointer must stop if the hardness meets predetermined requirements. See page 41.



ABOVE

CAST iron sectional coolers, described on page 41, provide more than 20,000 sq. ft. of cooling surface within a space said to cover an unusually small area. Sectional design provides for partial replacements.



THE NEWS OF THE WEEK

December Steel Output At 1,941,127 Tons—25,260,570 Tons For Year

DECEMBER production of Bessemer and open-hearth steel ingots totaled 1,941,127 gross tons, according to the American Iron and Steel Institute. This compares with 1,589,049 tons in November and with 1,798,606 tons in December, 1933.

Daily average production last month was 77,645 tons, equivalent to 35.26 per cent of the industry's available capacity. In the preceding month the corresponding figures were 61,117 tons and 27.76 per cent respectively. In December, 1933, the industry operated at 33.10 per cent of capacity and made 71,944 tons a day.

Total 1934 production of Bessemer and open-hearth steel ingots was 25,260,570 gross tons, compared with 22,594,079 in 1933, an increase of 11.8 per cent. Daily production in 1934 was 81,224 tons, compared with 72,884 tons in the preceding year, while available capacity was engaged at 36.89 and 33.53 per cent respectively in the two years.

MONTHLY PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(Gross Tons)

Reported for 1933 by Companies Which Made 97.82 Per Cent of 1933 Ingot Output

1933	Open-Hearth	Bessemer	Calculated Output All Companies Monthly	Calculated Output All Companies Daily	No. of Working Days	Per Cent Operation‡
January	885,663•	109,000	1,016,870†	39,110†	26	17.99†
February	922,798•	126,781	1,073,012†	44,709†	24	20.57†
March	784,111•	94,509	898,236†	33,268†	27	15.30†
April	1,180,823•	135,217	1,345,422†	53,817†	25	24.76†
May	1,716,425•	216,841	1,976,428†	73,201†	27	33.68†
June	2,211,652•	296,765	2,564,420†	98,632†	26	45.37†
July	2,743,326•	355,836	3,168,354†	126,734†	25	58.30†
August	2,430,663•	370,370	2,863,569†	106,058†	27	48.79†
September	1,991,204•	242,014	2,283,079†	87,811†	26	40.40†
October	1,847,690•	191,673	2,084,894†	80,188†	26	36.89†
November	1,331,029•	156,939	1,521,189†	58,507†	26	26.92†
December	1,629,495•	129,834•	1,798,606†	71,944†	25	33.10†
Total	19,674,879•	2,425,779•	22,594,079†	72,884†	310	33.53†

•Revised. †Adjusted.
‡The figures of "per cent of operation" are based on the annual capacity as of Dec. 31, 1932, of 67,386,130 gross tons for open-hearth and Bessemer steel ingots.

Reported for 1934 by Companies Which Made 99.39 Per Cent of Ingot Production in 1933

1934						
January	1,786,467	172,489	1,970,979•	72,999•	27	33.15•
February	1,993,638	175,873	2,182,826•	90,951•	24	41.31•
March	2,540,143	203,904	2,760,888•	102,255•	27	46.44•
April	2,622,372	257,482	2,897,529•	115,901•	25	52.64•
May	3,000,624	331,620	3,352,695•	124,174•	27	56.39•
June	2,714,983	282,592	3,015,972	115,999	26	52.68
July	1,343,732	119,869	1,472,584	58,903	25	26.75
August	1,245,445	109,598	1,363,359	50,495	27	22.93
September	1,126,415	117,580	1,251,630	50,065	25	22.74
October	1,325,225	127,789	1,461,932	54,146	27	24.59
November	1,447,297	132,059	1,589,049	67,117	26	27.76
December	1,797,830	131,456	1,941,127	77,645	25	35.26
Total	22,944,171	2,162,311	25,260,570	81,224	311	36.89

•Revised.
‡The figures of "per cent of operation" are based on the annual capacity as of Dec. 31, 1933, of 68,478,813 gross tons for open-hearth and Bessemer steel ingots.

Alloy Steels in Car Equipment

IN the paper by G. N. Schramm, E. S. Taylerson and Albert F. Stuebing, presented at the annual meeting of the American Society of Mechanical Engineers, New York, Dec. 4, 1934, and reprinted in THE IRON AGE of Dec. 6, 1934, a statement was made that the authors believed the nonlinear time-corrosion relationship of steel had not been pointed out previously.

The attention of the authors has been directed to the fact that the nonlinear time-corrosion relationship of steel was pointed out in an article by R. F. Passano, published in *Industrial and Engineering Chemistry*, November, 1933, page 1247.

British Steel Mills Continue 1934 Activity—Pig Iron Quiet

LONDON, ENGLAND, Jan. 7 (*By Cable*).—Pig iron consumption is substantial, but business is still under holiday influences. Stocks are small. Transactions are numerous and small shipments are going to Italy, Norway, Sweden, Holland and Argentina. Domestic consumption of East Coast hematite is active.

Business in semi-finished steel is quiet. Some finishing mills are working at full capacity and rail mills are well engaged. Plate mills are busier and better inquiry for sheets for home consumption and export is appearing.

Dorman Long has booked a Russian order for 8000 tons of universal plates, with prospects of a repeat order, and negotiations are proceeding regarding big Far Eastern orders. Tin plate is quiet, with lighter home trade and few exports.

The Continental iron and steel markets are busier with good English demand for semi-finished steel and better business in finished steel in other markets except the Far East. The International Ship Plate Agreement has been prolonged until Jan. 31. French hematite producers have agreed to form a national cartel.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9	
Billets, open-hrth.	£5 10s.	to £5 15s.
Tin plate, per base box	*18s.	2d.
Steel bars, open-hearth	£7	17½s.
Beams, open-hrth.	£7	7½s.
Channels, open-hearth	£7	12½s.
Angles, open-hearth	£7	7½s.
Black sheets, No. 24 gage	£9	5s.
Galvanized sheets, No. 24 gage	£11	5s.

*To March 1; 18s. 5d. thereafter.

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange

Billets, Thomas	£2	7s.	
Wire rods, No. 5 B.W.G.	£4	10s.	
Steel bars, merchant	£3	5s.	
Sheet bars	£2	8s.	
Plate, ¼ in. and up	£4		
Plate, 3/16 in. and 5 mm	£4	2s.	6d.
Sheets, ⅛ in	£4	7s.	6d.
Beams, Thomas	£3	2s.	6d.
Angles (Basic)	£3	2s.	6d.
Hoops and strip base	£4	2s.	6d.
Wire, plain, No. 8	£5	7s.	6d.
Wire nails	£5	15s.	
Wire, barbed, 4-pt. No. 10 B.W.G.	£8	15s.	

Pressure Vessel Code For Petroleum Industry

A JOINT committee of the American Petroleum Institute and the American Society of Mechanical Engineers has completed the first edition of the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels for Petroleum Liquids and Gases. The code covers the design, construction, inspection and repair of unfired pressure vessels for petroleum liquids and gases for metal temperatures not over 1000 deg. F. and for gage pressures above 15 lb. per sq. in. It is divided into five sections as follows: Design and construction of fusion-welded vessels; design and construction of riveted vessels; design and construction of seamless forged vessels (in course of preparation); inspection, repair and allowable working pressure of vessels in service; and material and other specifications.

A feature of the joint code is the inspection section and the requirement for changing operating conditions to keep stresses at or below those for which the vessel is designed or, as an alternative, removing the vessel from service. In the joint committee's announcement attention is called to the fact that the A.S.M.E. Boiler Code, Section VIII, dealing with unfired pressure vessels, has been adopted as the law governing construction of certain vessels of this type in several States and that consequently vessels within the scope of this section for use in these States must be built in accordance with the Boiler Code rules. The joint A.P.I.-A.S.M.E. Code does not have such a legal status.

Copies of the code can be obtained from the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York. Questions relating to the meaning of parts of the code and also as to the scope of its application should be addressed to the joint committee, the secretary of which is R. P. Anderson, 50 West Fiftieth Street, New York.

Tantalum Is Inert To Hydrochloric Acid

IN the Dec. 13 issue of THE IRON AGE, page 31, a statement was made that tantalum is not attacked by acids except hydrochloric. In fact tantalum has practically an infinite life in hydrochloric acid solutions, and the statement should have read that tantalum is exceptionally resistant to all acids with the possible exception of hydrofluoric. Tantalum containers find particular use in the food and chemical industries and in equipment subject to attack by hydrochloric acid and kindred solutions.

Pre-Fabricated Houses Planned

WASHINGTON, Jan. 8.—To carry into the field of pre-fabricated houses the Earley process of architectural concrete which made possible the mosaic ceilings in the Department of Justice, the Earley Process Corpn. was chartered Jan. 4 as a District of Columbia corporation. The offices are in the National Press Building, with a studio at 2131 G street, N. W., and a plant at Rosslyn, Va.

The finishing touches are being put on the first house to be built with precast panels of this process on the Colesville Pike, near Washington.

John J. Earley, the inventor of the process, is the president of the corporation, and Basil G. Taylor, engineer of the Earley Studios, is vice-president. Secretary-treasurer of the corporation is Oswald F. Schuette, a Washington newspaper man with an international reputation as a war correspondent and political writer. For several years following the World War, Mr. Schuette was the Washington correspondent of THE IRON AGE. More recently he has won distinction by his anti-monopoly campaign in the field of radio and copyright. Mr. Schuette is also president of the Radio Program Foundation.

Shipbuilding Remains At Recent Low Levels

THE United States remained at the bottom of the list of principal maritime nations in the volume of merchant tonnage under construction during 1934, according to the National Council of American Shipbuilders, New York.

As shown by Lloyd's Report, on Jan. 1, 1934, there were only 12,373 gross tons of merchant vessels above 100 gross tons under construction in American shipyards which was less than 1.6 per cent of world merchant tonnage under construction at that time.

The last available report of Lloyd's Register of Shipping which covers the quarter ending Sept. 30, 1934, shows that the total tonnage of merchant vessels under construction in the United States at that time was 22,225 gross tons or only 1.7 per cent of the world total under construction.

During 1934, the private shipyards of the United States were engaged almost wholly in the construction of naval vessels.

William W. Macon . . . . .

WILLIAM WATTS MACON, for 23 years identified with the editorial department of THE IRON AGE, during 14 years of that period as managing editor and editor-in-chief, died Jan. 1 in New York, following a cerebral hemorrhage.

Trained as an engineer to approach the problems of life realistically and with a scrupulous regard for facts, he had an ingrained distrust of anything smacking of exaggeration or grandiloquence. He would have wanted no eulogy; he needs none. His years of unremitting devotion to THE IRON AGE, marked by a seemingly tireless outgiving of energy to extend its influence and raise its prestige, are eloquent enough in themselves.

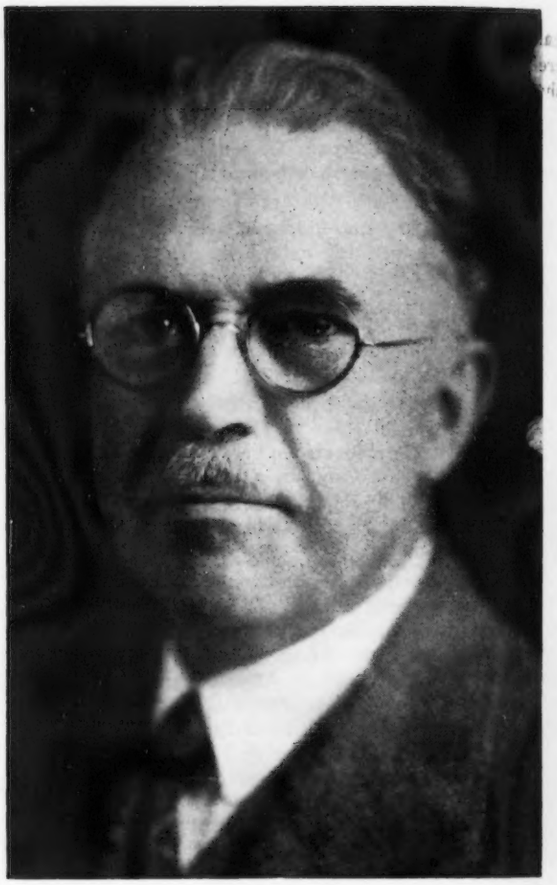
Work was his creed, work for the institution with which he had merged his life.

He was a proud man, but not in an egoistic sense. His pride was in the publication he served so faithfully. He believed that THE IRON AGE had given as much as or more to the great metal-working industry than it had received.

He had courage. He rose above expediency in guarding what he believed to be indispensable standards of trade journalism.

He was friendly. His love of comradeship and his ready wit will long bring back pleasant memories.

He was sympathetic but commanded respect. To quote one of the younger members of THE IRON AGE staff: "He was always spontaneous. I shall always think of him with some warmth because he was so receptive during my first interview with him. He was, moreover, very much of a man."



WILLIAM W. MACON

A Tribute From A. I. Findley, Editor Emeritus

IN their memories of his conspicuous editorial service William Macon's co-laborers will think of him first as a worker who never spared himself and whose loyalty to the ideals of this journal was his first imperative. In the past few years, when at times, all uncomplainingly, he contended with physical disability, the will to give his utmost to the paper and its readers was still outstanding.

Trained as a mechanical engineer, Mr. Macon saw early in his connection with THE IRON AGE how his horizon could be widened by close study of electrical and metallurgical developments in iron and steel and of production and management in the great metal-working field. Further broadening his equipment, he took up with enthusiasm the market side of the steel industry. And he was not long in winning a high place as an accurate reporter of market facts and a reliable interpreter of market trends. He aimed steadily to maintain THE IRON AGE tradition of independence in market comment and of fairness and accuracy in the quotation of prices.

For years he prepared the annual survey of steel production in the different finished forms, with makers' estimates of the tonnages shipped into various channels of consumption in the 12 months. These figures, published just at the turn of the year, often came close to the official statistics compiled months later. Leading companies were thus able to make use of them in planning for the year just ahead.

Mr. Macon believed that contact with the men who were achieving in all metal-working lines was indispensable, if this paper were to apply its full power to building up the country's greatest manufacturing industry. He was a familiar figure at conventions and a constant student of operations at progressive plants.

Accepting the dictum of Theodore Roosevelt that every man owes some of his time to the advancement of his vocation, he was most helpful in engineering society activities and did

much as an editorial association executive to bring the business press to a new place of influence.

He was one of the foremost among engineering editors in news sense and in right appraisal of reader interest 'ues. Also it was a part of his d that an industrial publication ..ould be in fact a creator of business and a promoter of the highest business standards.

Mr. Macon's associates in the strenuous editorial labors of post-war years have a deep feeling of personal loss in the passing of a loyal friend. His voice will be missed in their plannings, but his work and his ideals will long represent him as inspiring mentors and incentives to larger achieve- ent.

Mr. Macon's Career

MR. MACON was born in New York City, May 19, 1875, the son of William F. and Harriet O. (Marsac) Macon, and was graduated rom Cornell University as a mechanical engineer in 1898. At Cornell he was editor of the *Sibley Journal of Engineering* and upon his graduation from college was associated with the editorial department of the *Engineering Record* from 1898 to 1905. From 1905 to 1911 he was editor of the *Metal Worker*, following which he began his long period of service with THE IRON AGE. Early in 1930 he was made editor-in-chief, but after an exceptionally severe illness retired from that position at the beginning of 1932 and became consulting editor, in which capacity he served until the time of his death.

Mr. Macon was a director of The Iron Age Publishing Co. and was a member of the American Society of Mechanical Engineers, American Iron and Steel Institute, American Society of Heating and Ventilating Engineers, American Management Association, the Cornell Society of Engineers, of which he was a past-president, the Association des Ingenieurs de Chauffage et Ventilation de France, and the English Speaking Union. He was also a member of the Cornell Alumni Corpn., of which he was president in 1931 and 1932 and treasurer from 1918 to 1931. He was secretary of the class of 1898 of Cornell University. His club affiliations included the Engineers and Cornell, New York, and the Engineers Club of Brooklyn. He was a contributor to the Encyclopaedia Britannica and during the war period was a member of a party of American trade journalists which visited Great Britain and France as guests of the British Government.

OBITUARY

DAVID R. BOWEN, vice-president of the Farrel-Birmingham Co., Inc., Ansonia, Conn., and for 45 years its chief engineer, died at his home in that city on Dec. 29, aged 70 years. He was born in Wales and came to this country when he was 17 years of age. He entered the employ of the Farrel Foundry & Machine Co. as a machinist's apprentice in 1883 and later worked as a machinist and draftsman. During the next 10 years his exceptional ability as an engineer led to his appointment as chief engineer, which he held until 1930, when he was elected vice-president in charge of engineering. In July, 1933, ill health compelled him to relinquish active direction of engineering, when he became consulting engineer, continuing also as vice-president until his death.

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WILLIAM W. LUKENS, formerly president of the Alan Wood Iron & Steel Co., Conshohocken, Pa., died of pneumonia at his home in that city on Jan. 5, aged 65 years. He was a graduate of the University of Pennsylvania and had been associated with the company for more than 20 years prior to his retirement a few years ago.

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BRADFORD H. DIVINE, founder and president of Divine Brothers Co., Utica, N. Y., died on Nov. 24, aged 65 years. His son, B. Dalton Divine, has been actively connected with the company for over 11 years, for the last few years as general manager.

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GEORGE E. BATTEN, since 1924 San Francisco manager for the Ludlum Steel Co., Watervliet, N. Y., died in that city on Jan. 1, aged 48 years.

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A. J. BOYLE, vice-president and general manager of the Lamson & Sessions Co., Chicago, western subsidiary of the Lamson & Sessions Co., Cleveland, died Dec. 24, aged 47 years. He started in the bolt and nut industry in 1909 with the Pittsburgh Screw & Bolt Co. and transferred to the Gary Screw & Bolt Co. in 1912. He helped organize the Boss Nut Co. in 1916 and became affiliated with the Lamson company nine years later.

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JOHN A. SCHULTZ, JR., president, Schultz Die Casting Co., Toledo, died Dec. 27, after a short illness. He founded the Schultz company in 1930 and previous to that time was vice-president of the Doehler Die Casting Co., Toledo. He served as president of the Merchants and Manufacturers Association of Toledo and was prominent in other activities.

HENRY LLEWELLYN JONES, for 28 years foreign agent of the United States Steel Products Co., New York, died at St. Luke's Hospital in that city on Jan. 6, aged 64 years. He was identified for 44 years with subsidiaries of the United States Steel Corpn., including 16 years as engineer with the American Bridge Co. at Sydney, Australia, where he served as American vice-consul for three years. After that he represented the Steel Products company in the development of its foreign trade and traveled extensively in Europe and South America. Two years ago he was awarded a medal by the United States Steel Corpn. for 42 years of service.

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RODNEY A. PARKER, New England sales representative for the Republic Steel Corpn., died at his home in Waban, Mass., Dec. 23, after a two months' illness, aged 40 years. He was born in Cumberland Gap, Tenn. After his graduation from the University of Michigan he located in Cleveland and was connected until four years ago with the Bourne-Fuller Co., which was taken over by the Republic.

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FREDERICK FRANKLIN STOCKWELL, of the Cambridge, Mass., street railway supply company of Barbour, Stockwell Co., died at his home in Somerville, Mass., Dec. 22, following a long illness. He was born in Brattleboro, Vt., 72 years ago. Early in his career he formed a partnership with Mr. Barbour. Mr. Stockwell was secretary of the New England Foundrymen's Association since its inception.

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THOMAS MIDGLEY, inventor, died in Bradenton, Fla., Dec. 26. A native of England he came to America as a boy, began work with the American Steel & Wire Co., Worcester, Mass., and early turned to invention. Successively he was associated with the bicycle, automotive and rubber industries, and was one of the earliest inventors of removable tire rims.

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THOMAS H. PROSSER, senior member of Thomas Prosser & Son, metal dealers, New York, died after a long illness at his home in Garden City, N. Y., Dec. 23, aged 80 years. The firm was established in New York nearly 100 years ago by his grandfather. Since 1848 the company has represented the Krupp interests of Germany in this country. Mr. Prosser was a native of Brooklyn and was a graduate of the Brooklyn Polytechnic Institute.

PERSONALS

J. I. ANDREWS, who until an illness early in 1934 was general manager of sales and vice-president of the American Sheet & Tin Plate Co., has retired voluntarily. He had been identified with the company since its organization in 1904, and with the steel industry, except for a few years spent in the meat packing industry, since 1899 when he entered the employ of of the Illinois Steel Co. Mr. Andrews was born in Lakeland, Minn., Feb. 14, 1869, and received his education in the grade and high schools of Hudson, Wis., and at Macalester College, St. Paul. He was with the Illinois Steel Co. for three years, first in the company's general offices at Chicago and later at its Union and South Chicago works. He returned to the steel business in 1900 with the American Sheet Steel Co. in its general offices at New York. In 1904 the American Sheet Steel Co. and the American Tin Plate Co. were merged into the present American Sheet & Tin Plate Co., and the general offices transferred from New York to Pittsburgh. On Oct. 1, 1905, Mr. Andrews was appointed assistant general manager of sales of the combined companies and on Jan. 1, 1909, was appointed general manager of sales. In April, 1926, he was made vice-president.

F. C. HARPER, formerly secretary-treasurer of the American Sheet & Tin Plate Co., has been elected vice-president and general manager of sales. He became associated with the company in February, 1909. In April, 1931, he became secretary-treasurer to succeed H. B. WHEELER, who retired. Prior to his association with the American Sheet & Tin Plate Co., Mr. Harper had been assistant cashier in a Pittsburgh banking institution.

FRED M. FULLER, who has been general manager of sales for the past year, has been appointed assistant to the president. Mr. Fuller has been identified with the sheet and tin plate industry for more than 40 years. Beginning in 1894 with the Falcon Tin Plate & Sheet Co. of Niles, Ohio, he went to Chicago in 1898 when the Falcon company consolidated with the American Tin Plate Co. He later was transferred to the New York office of the company where he remained until 1904, when upon the formation of the American Sheet & Tin Plate Co. he was transferred to Pittsburgh. He was made assistant general manager of sales in 1909, becoming general manager of sales in January, 1934.

PERCY COOKE, formerly assistant secretary-assistant treasurer, has been elected secretary and assistant treasurer. He has been identified with the company for 30 years. He spent two years in the bureau of office supplies, and then became assistant secretary. In 1931 he was appointed assistant secretary-assistant treasurer.

L. K. HITCHINGS, who for the past 11 years has been associated with the company's treasury department, has been appointed assistant treasurer, with headquarters at Pittsburgh. He first became associated with the company in the Pittsburgh office, where he remained for about six years. For the past five years he has been a representative of the treasury department in the Chicago district. Previous to his connection with the Sheet & Tin Plate company he spent 14 years in sales work in the rubber industry.

M. L. GARDNER, who has been assistant for the past three years, has been elected treasurer. His entire career has been devoted to the company in the financial department.

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GRISWOLD A. PRICE has been made manager of sales for the St. Louis district for the Illinois Steel Co., Carnegie Steel Co. and the Tennessee Coal, Iron & Railroad Co., succeeding STILLMAN W. WHEELOCK, who has retired. Mr. Price was graduated from Northwestern University in 1919 and started his service with the Illinois Steel Co. in July of that year. He spent one year at Gary and South Chicago plants and from July, 1920, to June, 1931, he was employed in the Chicago district sales office and general sales department. In June, 1931, he was appointed assistant manager of sales of the St. Louis district.

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HARRY W. SCHUETZ has been appointed assistant to the vice-president and general manager of sales of the Pittsburgh Screw & Bolt Corpn., Pittsburgh, and will be in charge of all sales and field work pertaining to the Colona division. RICHARD D. BAKER has been named manager of sales for the Pittsburgh district on bolts, nuts, rivets and kindred products. HAMILTON FOLEY has been appointed manager of sales of the propeller division.

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GEORGE FONDA, head of the Weirton Steel Co.'s industrial relations department at Weirton, W. Va., has been appointed first assistant to JOHN C. WILLIAMS, president. The new office is designed to effect closer coordination between the employee representation plan and company officials.

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H. R. SCOTT, heretofore identified with the Baldt Anchor Chain & Forge Co., Chester, Pa., has been elected

JAY I. ANDREWS

F. C. HARPER

F. M. FULLER

PERCY COOK

M. L. GARDNER

president of the Delaware Alloy Forge Co., Philadelphia. Prior to his association with the Baldt company, he was with the Pennsylvania Forge Co., Philadelphia, for 12 years.

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O. A. VAN DENBURGH, JR., who has been connected with the Burden Iron Co., Troy, N. Y., since 1923, first as works engineer and later as assistant manager, has been elected vice-president and general manager of the company, succeeding the late William E. Millhouse. Mr. Van Denburgh was graduated from the Rensselaer Polytechnic Institute in 1913 as a mechanical engineer and became identified with the Cambria Steel Co. His later connections include the Aluminum Co. of America and a short time as mechanical engineer in the Bureau of Engineers of the United States Navy.

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JOHN KIRBY, formerly special assistant to DR. WILSON COMPTON, former chief of NRA's trade association division, has joined the staff of the Refrigerating Machinery Association, with headquarters in Washington.

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JOSEPH H. LYONS, of the Lyons Machine Co., has been reelected president of the northern Ohio division of the Special Tool, Die and Machine Shop Institute, Cleveland. HARRY E. BOLLINGER, of the Phoenix Ice Machine Co., has been elected vice-president, and EMIL P. HAHN, of the Hahn Mfg. Co., secretary-treasurer.

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JAY WALDECK, who advanced from a wire drawer to assistant general manager of operations of the American Steel & Wire Co., and who had had exceptionally long and diversified service with that company and its predecessor, the Cleveland Rolling Mill Co., Cleveland, under the optional regulation of the United States Steel Corpn., retired from active service Jan. 3, on his sixty-fifth birthday. A great portion of the time he spent in responsible positions and with a few short interruptions had a record of continuous service with the two companies. Recently he had been employed on special duties for the American Steel & Wire Co. and the Columbia Steel Co., another constituent of the Steel corporation.

Mr. Waldeck had a widely extended experience in the production of drawn wire and of cold-rolled strip. From his work as a wire drawer he passed successfully through all grades of activities in a steel plant, holding positions as assistant foreman, foreman, assistant superintendent, superintendent, assistant manager, manager of a district, and finally as assistant manager of operations of the entire company. His work included service in the position of plant superintendent or in higher positions in every district of the American Steel & Wire Co., including the Pacific Coast.

On the occasion of his retirement Mr. Waldeck was tendered a testimonial dinner Jan. 3 by a group with whom he had been associated in various plants. This was given at the Union Club, Cleveland, and was attended by, among others, C. F. BLACKMER, president, American Steel & Wire Co., and J. A. COAKLEY, general traffic manager of the Steel corporation, who acted as toastmaster. Mr. Waldeck will for the present at least continue in his home on the Pacific Coast.

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C. H. H. WEIKEL has been appointed manager of the commercial research and industrial development department of Bethlehem Steel Co., Bethlehem, Pa. He has been connected with the steel industry since 1912, having started his career with the frog and switch department of the Pennsylvania Steel Co. at Steelton, an organization which subsequently became a part of the Bethlehem company. He continued at Steelton, with experience in the steel foundry, maintenance and order departments until the war, when he left to serve in the army. Following the war he joined the accounting department at Bethlehem in 1919 and six years later he became associated with the legal department, with special duties in respect to development and research. He has been associated with the sales division since 1930.

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LEWIS B. LINDEMUTH, steel works operating consultant, New York, will leave Jan. 15 for Australia, where he will be engaged for about six months in the interests of the Broken Hill Proprietary, Ltd., New Castle, New South Wales.

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GEORGE W. THORNBURG, Crescent Park Brass Foundry, Waltham, Mass., has been made president of the New England Foundrymen's Association. A. S. WRIGHT, Hunt-Spiller Mfg. Co., Boston, is vice-president; ARTHUR W. GIBBY, Gibby Foundry Co., East Boston, treasurer, and ERNEST F. STOCKWELL, Barbour, Stockwell Co., Cambridge, Mass., secretary. Mr. Gibby succeeds his late brother, who had served as treasurer since the inception of the association in 1895, and Mr. Stockwell succeeds his late father, who had also served as an officer of the association since its organization. The executive committee of the association consists of WALTER M. SAUNDERS, JR., Providence, R. I.; THOMAS CURTIN, Waltham Foundry, Waltham, Mass.; HENRY JENSEN, General Electric Co., Lynn, Mass.; A. J. DAVIS, Freemont Casting Co., Worcester, Mass.; and CHARLES A. REED, Rogers-Brown-Lavino Co., East Cambridge, Mass.

G. A. PRICE

JAY WALDECK

C. H. H. WEIKEL

Swasey to Receive Washington Award

AMBROSE SWASEY, chairman, Warner & Swasey Co., Cleveland, manufacturer of machine tools and astronomical equipment, will receive the Washington award for 1935. This award was founded by John W. Alvord in 1916 and is given "in recognition of accomplishments which preeminently promote the happiness, comfort and well-being of humanity and in recognition as an engineer by his fellow engineers." The commission of awards represents the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the Western Society of Engineers.

Formal presentation of the award will be made at a joint meeting of the participating societies in Chicago during the week of Feb. 17. Mr. Swasey recently celebrated his eighty-eighth birthday.

THIS WEEK IN WASH

President Asks Four Billion For Reemployment

WASHINGTON, Jan. 8.—Turning from emergency and temporary legislation, President Roosevelt in his budget message to Congress yesterday asked for $4,000,000,000 in the fiscal year ending June 30, 1936, for recovery and relief. With balances carried forward, it is estimated at $4,582,000,000. He recommended appropriation of this sum in a single lump, "subject to allocation by the Executive principally for giving work to those unemployed on the relief rolls." The budget statement followed presentation on Jan. 4 of the President's annual message to Congress.

The appropriation was sought to carry out the President's declaration in his annual message of doing away with Federal direct relief and the inauguration of a large public works program to provide employment for 3,500,000. Pending the institution of the program, expected to be started next April, with full employment by Sept. 1, the President asked for $880,000,000 for relief, to be appropriated from unexpended balances, including $500,000,000 from the Reconstruction Finance Corpn., the total unexpended balance of which on Dec. 31 was $1,894,240,000.

With the Federal Emergency Relief Administration coming to an end, there will be set up a coordinated authority, the President disclosed, "which will be charged with the orderly liquidation of our present relief activities and the substitution of a national chart for the giving of work."

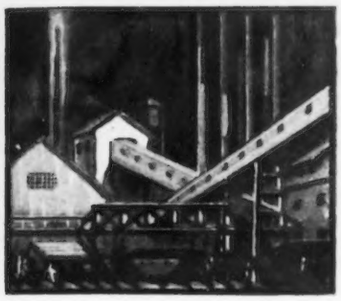
Benefits to Iron and Steel

Benefits to the iron and steel and other industries from the public works program will come through outlays for such new projects as slum clearance, rural housing, rural electrification, grade crossing eliminations, highway construction, extension of the CCC and non-Federal projects of a useful, self-liquidating character; reforestation and soil erosion prevention. No actual proposed projects were specified. No plans were provided for new kinds of loans to the durable or other industries. Aside from the benefits durable goods industries will get from the program proposed and in effect, it is clear that the Administration feels there is not a bright outlook for the heavy durable goods industries for a few years and that possible activity must come through replacement of obsolescent equipment and other such requirements. Such undertakings as large office buildings, apartment houses, etc., it is felt, already have been overdone and therefore activities of this kind will not be encouraged with Government funds.

For States and Municipalities

Of the $4,000,000,000 asked from Congress, it is proposed to lend approximately $1,000,000,000 to States and municipalities for work relief at the same rate of interest it costs the Federal treasury to borrow, perhaps about 3 per cent, plus a small amount to cover overhead. The grant system will be done away with. The Administration is hoping it will not be nec-

Iron and Steel Industry to Benefit from Huge Public Works Program, Which Includes Highway Construction and Grade Crossing Elimination



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By L. W. MOFFETT

Resident Washington Editor, The Iron Age

essary to expend the entire $4,000,000,000, but instead, that private industry will get under way sufficiently to take up the slack in unemployment.

However, the general belief is that most of the total, if not actually additional sums, will have to be spent before the huge roll of idle is reengaged. A similar hope has been expressed that the estimated total expenditures of $7,314,000,000 for the fiscal year 1936 will not be necessary. This total is $105,000,000 less than the estimate for the fiscal year 1935, but $922,000,000 in excess of the actual Federal expenditures for the fiscal year 1934. The President in his budget message told Congress that if the estimates he submitted are approved and if the expenditures for which authorization is asked are made in full, the deficit, including statutory debt retirements, will amount to $4,582,000,000 for the fiscal year 1936. The national debt, he stated, will be increased during this year by approximately $3,152,000,000, "thus bringing the total debt up to $34,239,000,000." This increase, it was pointed out, will be due solely to continued relief of unemployment.

The recovery and relief estimate for 1936 is about $600,000,000 under the 1935 estimate, due partly to cutting off of any provision for drought. The chief reasons for the increase in the total estimated expenditures for 1936 over 1935 are increases proposed for civil departments and agencies, for new buildings, highways, etc., with a total of $788,057,169, an increase of $222,000,000; national defense totaling $792,484,265, an increase of $179,699,000, and veterans' pensions and benefits, amounting to $704,885,500, an increase of $249,653,000. The national defense items, included in regular appropriations to make unnecessary further PWA borrowing, are made up of $477,224,665 for the Navy Department and $315,259,600 for the War Department. The TVA is for the first time in a separate item to be carried yearly hereafter with a proposed appropriation of $50,000,000.

The Government proposes to do its own public works jobs rather than through contractors, although where loans are made to private interests the latter will employ their own contractors. It is also proposed to pay relief workers less than private workers in order to encourage a shift from Government to private work.

The President has indicated that there is no proposed new taxation program further than the clarifying of and tightening up of administrative features of the internal revenue laws. But he has pointed out that if Congress insists upon a bonus it will have to provide funds through taxation. In his message he said detailed estimates of revenues and receipts for 1936 indicate a gain of $137,000,000 in the collections from income tax over those for 1935. The gain, he stated, is due to anticipated improvement in business and to the upward revision of rates in the revenue act of 1934.

"While I do not consider it advisable at this time to propose any new or additional taxes for the fiscal year 1936, I do recommend that the Congress take steps by suitable legislation to extend the miscellaneous internal-revenue taxes which under existing law will expire next June or July, and also to maintain the current rates of these taxes which will be reduced next June," said the President. "I consider that such taxes are necessary to the financing of the budget for 1936."

It was conceded that the budget cannot be balanced in the fiscal year 1936, but at the same time it was insisted it will balance, except for expenditures to give work. These expenditures, it was stated, may be expected to decline as rapidly as private industry is able to reemploy those who now are without work.

Business More Active In 1934

In discussing the economic situation, the President said business was substantially more active during the fiscal year 1934 than in either of the two preceding fiscal years. In the course of his discussion of this subject, the President said that the degree of recovery varied in the different industries. Production of nondurable goods, he pointed out, which has declined only moderately during the depression, approached within 1 per cent of its 1923-25 average, while output in the durable goods group, where prices showed relatively small declines since 1929, was 38 per cent below its average in those years.

At another point, the President added:

"Following the close of the fiscal year 1934, output in basic industries fell sharply through September, reflecting particularly an over-accumulation of inventories in steel and textile products and the delay in placing of orders for autumn merchandise be-

cause of uncertainty as to the effect of the drought."

Social and Economic Plan

In his annual message to Congress, the President outlined a general "social and economic" long range plan, an American plan, as he called it, and announced he would detail the plans to Congress at a later date for enactment at the present session. Immediate tasks before Congress were listed as consolidation of Federal regulatory administration over all forms of transportation, air, land and water, and renewal and clarification of NRA; abolition of the "evil features" of public utility holding companies, etc. Nothing was said of monetary or banking policies. Adherence to the profit motive was emphasized by the President, evidently to allay the feeling that the brain trust's espousal of its elimination was getting somewhere.

His "American plan" concluded a recital of previous expressions, naming three forms of security: security of livelihood through better use of national resources, recommended in the National Resource Board's report, and previously outlined in THE IRON AGE; security against major hazards and vicissitudes of life, and decent houses. Legislation to bring about these forms of security is anxiously awaited by the industrial world as well as the public generally, for industry clearly has developed a sympathetic interest in them to a greater degree than heretofore, though there are differences of view as to the means of accomplishing the purposes. Old age pensions, unemployment relief, etc., fit into the picture.

Steel in Washington Monument Cleaning

DRAMA in steel reached a nation-wide scale in the spectacular engineering feat of inclosing Washington monument in 600 tons of steel tubing, made up of 50,000 pieces. Fabricated together, they formed a strong web that reached the entire 555 ft. of the capital's outstanding land mark, seen from all directions for long distances. This corset of steel was the scaffolding on which nimble "steeple-jacks" worked up to the pointed capstone as they gave the monument an overhauling and a public bath, as thousands gazed daily. The job was done by Alexander Howie, Inc., Cleveland.

Erection of the scaffolding began Aug. 20. Dismantling began Jan. 2. It is estimated that three weeks will be required to remove the steel, which was bolted together tightly to give safety and assurance against fire or other accident. Steel is serving the purpose well. There has not been a single mishap. The job also served well as a demonstration of a growing outlet for steel.

Its face lifted and massaged, the monument will not require reconditioning for another 50 years, according to the National Park Service, Department of Interior, so well did the beauticians do the job. It was made possible by a PWA allotment. Item by item, the cost was $69,000 for erection, maintenance and demolition of the scaffolding, and between $16,000 and $18,000 for the actual repair work, including the cleaning. An average of 33 men, working an average of 23 hr. a week each, with a total of 11,300 man-hours, representing the labor involved in the repair work. Erection and dismantling will require 19,300 hours.

More Rugged Individualism!

Washington is wondering how long it will be before certain Administration rugged individualists will reassert this sort of individualism at which they so often scoff and which they so often practice. The departure of the fiery Gen. Hugh S. Johnson as keeper of the Blue Eagle, which, he now says, is as extinct as the dodo, has not removed rifts within the Administration by a long shot. They are springing up with ever increasing frequency. One of the newest is between the Federal Trade Commission and Donald R. Richberg, the Administration's right bower, who has clashed previously with the commission and who mixed with Johnson.

The latter row occasioned a fine piece of advertising for *The Saturday Evening Post*, which has been warned by Mr. Richberg that it would be held responsible for statements to be made by the doughty general in the series of articles he has prepared for that publication.

The latest run-in between the FTC and Mr. Richberg is over the monopoly issue. The commission has grown stout and sturdy through its divers roles as the champion of "small enterprise," the Sir Galahad achieving the Holy Grail by way of chartering business and the little David whacking the Goliath, modernized under the term monopoly. The commission, just like any other Government body, loves power, a large section of which NRA grabbed from it, and it wants Congress to authorize it to bar one corporation from obtaining control over another by buying its stocks and assets or by consolidations and mergers.

This is not a new recommendation at all but it has a barbed point at this time. It looks like a real dig at the NRA, Mr. Richberg's pet, which the FTC does not regard affectionately. The feeling is mutual. Mr. Richberg once before lashed the commission for its attitude on the steel basing point system, and General Johnson has said many unkind things about the commission.

The commission's shafts at the NRA have been directed more skillfully than have the return darts, and it's a safe bet that the commission in the public and Congressional view has scored the most points. Its sponsorship for small enterprise has made a strong appeal to both and may well result in NRA being revamped either by Administrative or legislative action —or both.

Will Entertain Steel Executives

Steel executives in their frequent calls at the executive offices of the White House will be made to feel perfectly at home if they become acquainted with Capt. Clarence Dalrymple of the White House police force. The captain many years ago was a puddler and enjoys talking shop. Still tough as nails physically, the captain is in trim at any time to manipulate a mean rabble. The other famous puddler in Washington is Senator Jim Davis, whose one-time rough clothing has given way to raiment straight from Bond Street or Madison Avenue.

Southern Pacific Expenditures

The iron and steel industry benefited to the extent of $4,260,000 from the PWA loan of $12,000,000 made to the Southern Pacific railroad last year. In a statement by Harold L. Ickes, Public Works Administrator, telling how the money was spent, he listed the iron and steel industry share as indicated, $1,763,804 going for 40,000 tons of rails. Other purchases included 1,800,000 cross ties. More than 5000 freight cars, passenger cars and locomotives have been put through the carrier's shops for repairs. Total expenditures to Nov. 15 were $10,882,162. The amount paid in wages was $4,436,125, slightly in excess of iron and steel purchases, and represented 8,283,420 hr. of labor.

Contractors Have Plans

Engineers, contractors and constructors have seized upon the Administration's public works program to call meetings in Washington at which plans for cooperation will be discussed, along with other subjects. Executive Secretary Frederick M. Feiker of the American Engineering Council has announced that the council will meet Jan. 10, 11, and 12. Invitations to approximately 3000 of the nation's leading contractors and construction men have been issued by the Associated General Contractors of America to attend its sixteenth annual convention Jan. 28, 29, and 30. At the Engineering Council meeting officials from each of the Federal units engaged in construction and allied work will appear to outline their objectives before the engineers, representing national, State and local organizations throughout the country.

General headings to be discussed will be those stated in the President's message to Congress, such as high-

ways, housing, grade crossing elimination, reforestation, erosion control, etc. The situation as concerns PWA construction will be presented by Maj. P. B. Fleming, Deputy Administrator of PWA. Relationships between private and public construction will be discussed by Col. D. H. Sawyer, director of the Federal Employment Stabilization Board and former Public Works Administrator. Relief in its various construction forms will be outlined by Jacob Baker, assistant administrator in charge of the Work division of FERA and by Thomas Hibben, chief engineer of FERA. The FHA will be represented by C. C. Anthony, assistant administrator.

Railroad Repair Expenditures

American railroads propose to spend $65,000,000 on freight car repairs in 1935, according to the report made by the car polling section to Joseph B. Eastman, Federal transportation coordinator.

Price Fixing in Resource Industries

The seal of official approval on price fixing for natural resource industries is seen in an announcement by Acting Divisional Administrator Wayne P. Ellis that the National Industrial Recovery Board considers the making of contracts to sell bituminous coal below the code price an evasion of the terms of the code. The statement sounds like a platitude, for, obviously, if code prices are agreed upon with Governmental sanction and are not adhered to it would be "an evasion of the code."

The announcement is significant because so-called chiseling of bituminous coal prices has been rampant and NIRB has come to the aid of the industry in a frantic effort to stop the practice. Its statement is designed to lend Governmental support to fixing of prices and Governmental wrath for violations.

The industry offered amendments to stop price cutting, especially on long-term contracts, proposing that the industry itself fix prices. The NIRB proposed its own amendment giving the board the right to fix prices, opposed by the industry. The industry encountered differences within itself as developed at hearings on the amendments, but Governmental approval of coal price fixing was made clear.

Repairs to Farm Dwellings

Farm dwellings need $576,687,000 for repairing, modernizing and replacement, according to a survey conducted by the Bureau of Home Economics, Department of Agriculture, and made available through the Federal Housing Administration.

NRA Announces Policy on Advertising Allowances — Other Code News

WASHINGTON, Jan. 8.—When code restrictions on advertising allowances are proposed the provisions may limit such allowances to payment for definite and specific advertising or promotion services, and may prohibit any price reduction, discount, bonus or rebate being designated an advertising allowance, according to NRA policy on this subject announced by the National Industrial Recovery Board.

According to the announced policy, it may be provided that agreements to purchase advertising services from customers must be in written contracts separate from sales contracts. Such contracts must "specifically and completely set out the promotion services to be performed, together with the precise consideration to be paid therefor, the method of determining performance, and all other terms and conditions related thereto."

Arrangements for publicity may be made, the policy specifies, in cases where "effective machinery therefor can be devised." Such arrangements should not be "so cumbersome that its cost will outweigh benefits to be gained."

The announcement of the new policy recognizes that "code provisions declaring the giving of advertising allowances an unfair practice would not change the basic fact that sellers must price their goods to buyers and that certain buyers have promotion services which they are desirous of selling for which those who sell to them are willing to pay."

COMPLETE WIRE AND IRON FENCE

The supplementary code authority for the complete wire and iron fence industry has submitted a uniform cost accounting system for NRA approval. The supplementary code provides that after the system has been approved "all members of the industry shall determine and/or estimate costs in accordance with the principles of such methods."

Cost is defined as "the sum of the amounts or equivalents paid, or charged, or given for (a) materials; (b) direct labor; (c) general factory expense and (d) administrative expense." Each of these elements is also defined.

INDUSTRIAL SAFETY EQUIPMENT

The code authority for the industrial safety equipment industry and trade has petitioned NRA for revision of its code provision covering price filing. Under the proposed change, industry members would be required to file price lists, discounts, rebates, allowances and other terms of sale with a "confidential and disinterested agent of the code authority" or to some other agency designated by NRA, providing a majority of industry members voted to adhere to a published price policy. All members would be required to adhere to their filed prices.

Price terms and revised prices would become effective immediately upon filing. The code authority would be required to maintain a permanent file of all prices filed and, upon request, to furnish the Administration with copies of such prices. After filing a revision, members would be prohibited from filing a higher price within 48 hr.

ALUMINUM CODE EXTENDED

The NIRB has extended the code for the aluminum industry for a further period of 45 days. The code would have expired Jan. 6. This extension was granted to permit the board to study fully a report of past practices of the industry and any modifications of such practices or effect upon such practices resulting from the code provisions. The report had been made to the board by the Division of Research and Planning, "to determine the extent to which the code has operated to protect small enterprises from any alleged oppression or discrimination and has aided to effectuate" the National Industrial Recovery Act.

COAL MINE CUTTING AND LOADING MACHINERY

Approval of codes for the coal cutting machine and the coal mine loading machine industry has been announced by the NIRB. The codes were approved on the condition that provisions prohibiting "wilfully" destructive price cutting be stayed, and that the Coal Cutting Machine Manufacturers Association and the Coal Mine Loading Machine Manufacturers Association delete from their by-laws the words "and further assents to the code or codes of the industry." The usual standard trade practices appear in the codes.

CODE AUTHORITY MEMBERS NAMED

The following code authority members have been accorded NRA approval:

Metal Hospital Furniture Manufacturing Industry—A. G. Clampitt, Hamilton Mfg. Co., Two Rivers, Wis.; C. O. Benedetti, Scanlan Morris Co., Madison, Wis.; Joseph A. Miner, American Metal Co., Indianapolis; L. L. Watters, Hospital Supply Co., New York; John M. Liptay, Hospital Furniture Corpn., Long Island City, N. Y.; and Samuel S. Spielberg, Brooklyn Hospital Equipment Co., Johnstown, Pa.

Bakery Equipment Manufacturing Industry (Division of the machinery and allied products industry)—Martin Miller, American Machine & Foundry Co., New York; Clarke Dean, Union Steel Products Co., Albion, Mich.; Fred D. Pfenning, Fred Pfenning Co., Columbus, Ohio; Carl Pletscher, Baker-Perkins Co., Inc., Saginaw, Mich.; and C. L. Russell, American Bakers Machinery Co., St. Louis.

Complete Wire and Iron Fence Industry (Division of the fabricated metal products industry)—W. L. Robertson, W. F. Robertson Steel & Iron Co., Cincinnati; W. F. Brannan, Anchor Post Fence Co., Baltimore; C. E. Kendall, Pittsburgh Steel Co., Pittsburgh; W. H. Bleecker, Page Steel & Wire Co., Monessen, Pa.; H. I. Raymond, Enterprise Iron Works, Indianapolis; W. S. Rich, Stewart Iron Works Co., Cincinnati; J. T. Hanley, American Wire Fence Co., Libertyville, Ill.; J. S. Eskin, Wickwire Spencer Steel Co., New York; and M. J. Sayles, Independent Fence Co., Brooklyn, N. Y.

Air Valve Industry—M. S. Little, M. S. Little Mfg. Co., Hartford, Conn., to succeed G. E. Gage, resigned.

Flexible Metal Hose & Tubing Manufacturing Industry—S. H. Collon, Pennsylvania Flexible Metallic Tubing Co., Philadelphia; J. F. P. Farrar, Chicago Tubing & Braiding

Co., Maywood, Ill.; C. W. Fletcher, Titeflex Metal Hose Co., Newark, N. J.; C. S. Hungerford, American Brass Co., Waterbury, Conn.; W. H. Miller, International Metal Hose Co., Inc., Cleveland; and E. E. Lewis, Eclipse Aviation Corpn., East Orange, N. J.

TRADE PRACTICE COMPLAINTS PLANS APPROVED

Organization and procedure plans for the following trade practice complaints committees have been given NRA approval:

Marine Equipment Manufacturing Industry—Conditional approval given procedure plans; committee to consist of the following code authority members: Phelps Ingersoll, Wilcox-Crittenden & Co., Middletown, Conn.; William H. Young, A. B. Sands & Son Co., New York; Ralph H. Schmidt, New York Boat Oar Co., New York; and R. W. Morrell, New York, Administration member.

Pump Manufacturing Industry—Conditional approval given procedure plans; committee to consist of the following members of the industry's supervisory agency: C. E. Searle, Worthington Pump & Machinery Corpn., Harrison, N. J.; G. R. Alexander, Byron Jackson Co., Bethlehem, Pa.; D. R. Lowry, Ingersoll-Rand Co., New York; A. D. Harvey, Nash Engineering Co., South Norwalk, Conn.; and H. L. Watson, De Laval Steam Turbine Co., Trenton, N. J.

Ordnance Department Announces Additional Machine Tool Awards

WASHINGTON, Jan. 3.—Awards totaling approximately $1,600,000 have been made by the Army Ordnance Department out of an allotment of $2,300,000 made to it by the PWA for the purchase and installation of machine tools at arsenals and field service stations. The arsenals will readvertise for the remaining equipment to be purchased, valued at about $400,000, the balance left out of the total allotment representing the cost of installation. Since publication of two previous lists in THE IRON AGE awards have aggregated about $1,000,000 and have been widely distributed to makers all over the country.

Among the more important awards made in addition to that already announced are the following:

Pangborn Corpn., sand blasting installation, $8,762; one abrasive blast cleaning machine, $1,980. Yates-American Machine Co., one six-spindle gang wood boring machine, $1,335; one woodworking planer and matcher, $5,328. Gehnrich Corpn., one wood drying kiln, $1,180; one paint baking oven, $1,203. J. A. Fay & Egan Co., four wood speed lathes, $1,526. Oliver Machinery Co., one hollow chisel mortiser, $951; one woodworking single surfacer, $978; one disk and spindle sander, $1,077. Solem Machine Co., one woodworking single surfacer, $1,025.

R. K. LeBlond Machine Tool Co., 12 shell turning lathes, $65,102. Lloyd & Arms, Inc., four shell turning lathes, $11,976; eight hydraulic shell boring lathes, $55,498; one automatic hob sharpening machine, $2,495; three duplex universal millers and shapers, $10,239. Monarch Machine Tool Co., three form turning lathes, $27,917; one electric full-automatic, double-carriage lathe, $3,977. Gisholt Machine Co., one turret lathe, $8,030. Warner & Swasey Co., one turret lathe, $10,416.

Acme Machine Tool Co., one turret lathe, $8,631. William Sellers & Co., Inc., one horizontal boring mill, $18,370. Henry Prentiss & Co., three horizontal boring mills, $30,432; two horizontal boring, drilling and milling machines, $19,892; one gear hobbing machine, $2,696; ten 7-in. toolroom lathes and four sets of equipment, $7,702; three 9-in. motor driven bench lathes, $1,785; one hob grinding machine, $1,765.

Lucas Machine Tool Co., six horizontal boring mills, $71,142. Stedfast & Roulston, Inc., two horizontal boring mills, $29,092; one vertical boring mill, $9,858. Marshall & Huschart Machine Co., one automatic gear hobbing machine, $16,554. Consolidated Machine Tool Corpn. of America, one 20-in. gear tooth rounding machine, $1,475. Fellows Gear Shaper Co., one gear shaper, $4,724; two high-speed gear shapers, $7,636.

Westinghouse Electric & Mfg. Co., two transformers, $3,191; two electric motors, $217. Kuhlman Electric Co., six transformers, $3,056.

W. E. Shipley Machinery Co., seven 8½-in. screw cutting bench lathes, $13,812; two drilling machines, $2,523; one head trimming machine, $2,523. Hall Planetary Co., two thread milling machines, $12,810. Pratt & Whitney Co., two thread millers, $8,374; two vertical millers and profilers, $10,526; one spline miller, $2,865; one precision locating and jig boring machine, $17,472; one jig boring machine with one set of extra equipment, $5,713; two milling machines, $4,016; one jig boring machine, $8,707; two universal die sinkers, $11,678; three automatic toolroom machines, $46,200; one rifling machine, $5,943; two chambering machines, $19,456; one measuring machine, $2,080.

Hanson-Whitney Machine Co., three thread hobbing machines, $16,527. O'Brien Machinery Co., one pipe threading and cutting machine, $1,353. Kemp Machinery Co., one pipe threading and cutting machine, $2,001. Oster Mfg. Co., one pipe threading and cutting machine, $1,354. Billings & Spencer Co., one motor-driven trimming die milling machine, $2,100. Lynd-Farquhar Co., one toolroom milling machine, $3,793. Swind Machinery Co., one toolroom duplex milling machine, $2,180. Triplex Machine Tool Corpn., two toolroom duplex milling machines, $5,987.

Brown & Sharpe Mfg. Co., three universal milling machines, $10,870; two standard vertical-spindle milling machines, $7,204; one plain fixed-bed milling machine, $3,562; one universal cylindrical grinder, $2,777. Cincinnati Milling Machine Co. & Cincinnati Grinders, Inc., six vertical milling machines, $31,058; one three-dimensional cam cutting machine, $9,860; four light automatic milling machines, $7,893; 13 heavy-duty milling machines, $50,048; four medium automatic milling machines, $9,960; ten universal tool and cutter grinders, $13,857. Kearney & Trecker Corpn., two universal milling machines, $17,188.

Norton Co., two grinding machines, $1,899; five plain cylindrical grinders, $30,134. Gallmeyer & Livingston Co., one surface grinder, $4,121. Diamond Machine Co., seven surface grinders, $13,866. Landis Tool Co., one internal grinding machine, $5,728.

National Electric & Welding Machine Co., three spot welders, $3,422. Hobart Bros. Co., three electric welders, $4,591. General Electric Co., one atomic hydrogen arc welder, $1,356. Thomson-Gibb Electric Welding Co., one electric spot welder, $3,405.

Tinius Olsen Testing Machine Co., five testing machines, $7,085.

Erie Foundry Co., one forging hammer, $5,295. Chambersburg Engineering Co., one board drop hammer, $9,290. Sleeper & Hartley, Inc., one universal spring coiling machine, $1,329; one music wire straightening and bundling machine, $611.

Jones & Lamson Machine Co., one semi-automatic gun barrel multi-tool turning lathe, $5,338. Seneca Falls Machine Co., 12 high-speed barrel lathes, $25,110. American Tool Works, one gun turning and boring lathe, $27,500. Porter-Cable Machine Co., two shell turning lathes, $5,368. H. W. Allen Co., Inc., one extension gap lathe, $3,442. Lodge & Shipley Machine Tool Co., three geared head lathes, $9,349; three heavy-duty lathes, $35,461. Cincinnati Electrical Tool Co., two abrasive cut-off machines, $1,062.

Gardner-Denver Co., one air compressor, $3,460. C. F. Pease Co., one blueprinting machine, $1,719. Chicago Pneumatic Tool Co., one air compressor, $1,675. Foster Machine Co., two centering machines, $5,938. Bardons & Oliver, one head turning and trimming machine, $6,275. The Watson-Stillman Co., one truck tire hydraulic press, $2,410.

Ideal Machinery Co., seven high-speed power hack saws, $9,375. Williams, White & Co., one 500-ton hydraulic press, $9,450. The V. & O. Press Co., one punch press, $927; one double-action press, $3,948; two bench power presses, $1,108; two double-action presses, $2,617. Austin-Hastings Co., Inc., one 10-ft. bending brake, $7,154. Henry & Wright Mfg. Co., one 75-ton dieing machine, $6,812. Florence Pipe & Foundry Co., one 100-ton hydraulic press and pump, $1,275.

Carnegie Company Employees Ask Federal Courts to Set Aside Labor Board Order

WASHINGTON, Jan. 8.—Employee representatives of the McDonald, Ohio, mill and the Duquesne, Pa., plant of the Carnegie Steel Co. have engaged Hogan, Donovan, Hartson & Guider, Washington, as counsel and have filed petitions with the United States Courts of Appeal at Philadelphia and Cincinnati respectively, alleging that the elections ordered at their plants are not in the public interest and asking that they be estopped.

The petitions were filed by the employee representatives through the general body committees at each of the works, and the law firm has explained that the appeals were taken solely on behalf of the employees and not on behalf of the company.

The action of the employee organizations follows the decision of the National Steel Labor Relations Board of Dec. 31 which, as a preliminary to employee elections, ordered the Carnegie company to produce the payrolls of the McDonald mill and the Duquesne plant within seven days or, in the event of court action, five days following the court decision. The petitions filed with the courts of appeal therefore automatically postpone the time when the board's order must be complied with. While the time required by the courts to reach a decision cannot be accurately forecast, it is estimated that even if there is reasonably expeditious handling of the cases they will not be disposed of before the end of March.

If the petitions of the employees are denied and the company refuses to deliver its payrolls, three courses are open to the Government. It may remove the company's Blue Eagle for non-compliance with the recovery act; it may impose fines or take action to imprison officers of the company for violating rules and regulations established to carry out the purposes of the act; or it may apply to the United States courts for injunctions to enforce delivery of the company's payrolls.

Allege Errors by Board

The petitions of the employee representatives in presenting reasons for review of the orders, give in detail alleged errors the board made in its findings. At the outset, it is charged that the board erred in ordering that elections be held. It is declared that the employee representatives were elected in June, 1934, for a period of one year by approximately 90 per cent of the men in the mills affected, that the representatives have been actively engaged in collective bargaining with the management since their election and that a great majority of the questions taken up have resulted in decisions in favor of the employees.

It is also pointed out that the Carnegie Steel Co. has indicated its willingness to deal with the Amalgamated Association of Iron, Steel and Tin Workers in collective bargaining for its members and any other employees who wish to be represented by the association. The company, it is pointed out, has obligated itself over the signature of the president to deal with the employee representatives for those employees whom they represent. It is held therefore that there is no justification of an order for an election.

"There is no unrest or discontent in either of the plants affected by the board's order," said a statement issued by the employees' counsel, "and in its findings the board did not find any; therefore it is difficult to understand how it can be in the public interest to hold elections."

The statement said the action taken is in accordance with the statute under which the steel board was created and that "the employees in their petitions for review are not questioning the constitutionality of NRA, or any other law, but are proceeding in accordance with those laws, and, in view of the existing facts, no elections are justified in these plants."

Amalgamated Challenged

The petition challenges numerous claims of the association, principally the one that it represents the majority of workers at the McDonald and the Duquesne mills and contends that the employee representation plan is a proper vehicle for the exercise of the right of collective bargaining under Section 7-a of the recovery act. It is also declared that the steel board erred in not finding that employees expressed their choice as to whether or not the employee representation plan was the proper unit for collective bargaining and was voluntarily selected by the employees.

Amalgamated's Reply

Commenting on the action of the employee representation groups, Charlton Ogburn, counsel for the amalgamated union, said: "It is obviously a move of the company. The employees plans have no funds of their own. The members pay no dues, nor have the groups the right to sue or be sued, except as individuals."

McDonald Mill Not a Unit

CINCINNATI, Jan. 8.—In the petition filed here, it is specifically claimed that the McDonald mill is not a proper unit for employee representation but that the Youngstown district is a proper unit and was so determined by previous election. It is also stated that the board erred in finding that Buckeye Lodge had 1016 members at McDonald; that employee representation is the proper vehicle for collective bargaining; that the employees have had opportunity to express and did express their choice as to whether an employee representation plan or any other plan was desired and that they chose employee representation; that the election was fairly conducted and the employees freely and voluntarily expressed their opinions; that employee representatives have been elected for one year and are still serving efficiently and faithfully.

Other Elections Ordered

WASHINGTON, Jan. 8.—With the collapse of White House efforts to arrange a truce between the steel industry and the Amalgamated Association of Iron, Steel and Tin Workers, the National Steel Labor Relations Board is moving rapidly with cases before it. It issued orders today for three more elections and at the same time denied the petition of the association for an election at the plant of the Acme Steel Co., Riverdale, Chicago. The elections ordered involve the East Chicago, Ind., and South Chicago, Ill., plants of the Youngstown Sheet & Tube Co., and the Gary works of the Illinois Steel Co., Gary, Ind.

As in orders for elections at the McDonald and Duquesne plants of the Carnegie company, those issued today provide that elections be held within seven days after their promulgation. The orders require the Sheet & Tube company and the Illinois company to submit their payrolls to the board prior to the elections, which the board would supervise. In the event of court action, it is ordered that the payrolls be submitted five days after the decision and elections be held on the seventh and eighth days subsequently.

In denying the association petition for an election at the Acme plant, the board held the charge of dis-

crimination against five employees was not justified.

In the orders in the Sheet & Tube and Illinois Steel cases the board says that it is clear that elections held on the employee representation plans were sponsored by the companies and were not elections as contemplated by the resolution creating the steel board.

The orders provide for the choosing of tellers from both the Amalgamated association and the employee representation group, the voting to be entirely secret and the result to be certified to the board. The polling places are not to be located on company property, and are to be publicly advertised two days prior to the elections. The Amalgamated association claims to represent in excess of 50 per cent of the employees at each of the two Sheet & Tube plants and approximately 50 per cent of the employees at the Gary plant. In referring to the election March 1, 1934, at the Gary plant on the employee representation plan, the order says there were 10,143 eligible voters and 8231 votes were cast, of which 4000 were for approval of the plan and 3272 were against the plan. At an election June 15, 1934, to choose representatives for collective bargaining the board said there were 11,508 eligible voters and 10,243 ballots were cast, of which 4422 were void. It was stated that it does not appear how many votes were cast for the group plan and how many were in opposition.

The Acme petition filed by the Amalgamated charged discrimination against three employees and demotion of two employees because of union activities. Neither charge was sustained, the board said. In connection with the discrimination charge the board said the company has stated its intention of recalling the three men when business justified. It declared that no strike was involved and the only evidence by the workers of union activities was in their regular attendance at union meetings. The evidence, it was added, does not show the company interfered with these union activities.

In selecting men to lay off, the board declared, a very careful system of rating by points was followed.

The steel board at its peak had some 20 cases before it. It was stated that most of them have been settled through elections and negotiations. Only one election case is before it, involving the plant of the Continental Can Co., Chicago. Another pending case involves alleged discrimination at the Warren, Ohio, plant of the Republic Steel Corpn., but does not call for an election. Neither is an election involved in the case of the Aliquippa, Pa., plant of the Jones & Laughlin Steel Corpn. It concerns a charge of alleged interference with workers in the exercise of the right of collective bargaining.

NRA Bitterly Attacked by Its Own Consumers' Advisory Board

WASHINGTON, Jan. 8.—Sizzling attacks on the policies of the NRA are made by one of its units, the Consumers' Advisory Board, which has recommended that sweeping changes be made at once which would confine the majority of codes to the governing of hours, wages, child labor practices, collective bargaining and fair trade. It is urged that Congress in revising the NRA do so along the lines suggested.

It is charged that the original purposes of the law, "to promote the fullest possible utilization of the present productive capacity of industries, to avoid undue restriction of production . . . to increase the consumption of industrial and agricultural products . . . and to conserve natural resources," have been lost sight of entirely. Charges of price fixing, and monopoly through codification are freely made throughout the report. It is contended that if the recovery act has unduly "restricted production, prevented the fullest possible utilization of productive capacity or failed to increase consumption, it is because the pressure of special interests for individual advantage has diverted the course of the act from that which Congress intended it to follow." Increased Government control is urged and return to wide open competition, with certain exceptions, is strongly recommended.

The recommendations are reduced to the following terms:

"1. That the Government retain the right to impose codes of fair competition as a measure of industrial control.

"2. That the vast majority of these codes be confined to the establishment of simple minimum standards governing hours, wages, child labor, collective bargaining and fair trade practices.

"3. That there be added to the standards comparable quality standards for the protection of the consumers.

"4. That definite limits be set on such price and quality controls as may be permitted to code authorities in exceptional cases.

"5. That public membership on code authorities be made proportionate to the powers which they exercise.

"6. That the tariff section of the act be repealed.

"7. That provision be made for the collection of complete industrial statistics."

Pacific Coast Steel Conference Planned

SAN FRANCISCO, Jan. 8.—Nationally recognized steel executives will address the eleventh annual conference of the Iron, Steel and Allied Industries of California, which is to be held at Del Monte, Cal., Feb. 8 to 10.

Norris G. Clark, vice-president in charge of sales, Republic Steel Corpn., will discuss the effect of the New Deal on the steel industry. The American Institute of Steel Construction will be represented by its president, C. G. Conley, president, Mount Vernon Bridge Co., Mount Vernon, Ohio.

The administration of codes pertaining to the allied industries will be discussed by outstanding authorities. From Chicago comes R. W. Johnson, executive secretary of the reinforcing material fabricating industry, who will speak on the developments in the reinforcing steel industry. Donald Renshaw, regional administrator on code compliance, will address the conference. Walter S. Doxey, executive secretary of the American Steel Warehouse Association, will discuss some of the major problems of distribution. The conference, under the leadership of E. Jungquist, of Percival Steel & Supply Co., and W. W. Glosser, of Hubbard & Co., promises to set attendance records, according to the secretary, Charles S. Knight.

The tone of optimism to be carried into the convention is clearly indicated in the response received to a letter addressed to leading Pacific Coast steel executives asking for their forecast of steel activity during 1935. A Los Angeles executive states: "It appears to us that private capital may again start to flow into the investment of materials which has been the long felt need of capital goods manufacturers."

A leader in the Northwest points to improved conditions over the same period of a year ago. A San Francisco executive says: "We are slowly but surely coming out of it and we look for real improvements in 1935." The confidence is based on the school rehabilitation program, aqueduct work, increased State highway construction, Federal building, dam and bridge projects and the reappearance of private construction.

Western Gas Construction Co., Fort Wayne, Ind., has been consolidated with parent company, Koppers Construction Co., Pittsburgh, and activities formerly carried on in the name of former will hereafter be carried on under the name of Western Gas Construction division of Koppers Construction Co.

December Pig Iron Output Up Almost 4 Per Cent

PRODUCTION of coke pig iron in December totaled 1,027,622 gross tons, compared with 956,940 tons in November. The daily rate in December, at 33,149 tons, increased 3.9 per cent over the November rate of 31,898 tons a day. For the 12 months, production was 15,911,188 tons, compared with 13,212,785 tons in 1933.

There were 69 furnaces in blast on Jan. 1, making iron at the rate of 37,615 tons a day, against 59 furnaces on Dec. 1, operating at the rate of 29,395 tons a day. Fourteen furnaces were blown in during the month, of which six were Steel Corporation units, seven were independent steel company furnaces, and one was a merchant stack. Four furnaces were blown out or banked, two of which were independent steel company stacks and two, merchant furnaces.

Among the furnaces blown in were the following: One Donner and one Haselton, Republic Steel Corpn.; one Aliquippa, Jones & Laughlin Steel Corpn.; one Sparrows Point, Bethlehem Steel Co.; two Campbell, Youngstown Sheet & Tube Co.; one Toledo, Pickands, Mather & Co.; one Weirton, National Steel Corpn.; one Monongahela and one Lorain, National Tube Co.; one Ohio, Carnegie Steel Co.; one South Chicago and one Gary, Illinois Steel Co., and one Ensley, Tennessee Coal, Iron & Railroad Co.

Furnaces blown out or banked included: one Standish, Chateaugay Ore & Iron Co.; one Palmerton, New Jersey Zinc Co.; one Steelton, Bethlehem Steel Co., and one Columbus, American Rolling Mill Co.

Daily Average Production of Coke Pig Iron

Gross Tons

	1934	1933	1932	1931
January	39,201	18,348	31,380	55,299
February	45,131	19,798	33,251	60,950
March	52,243	17,484	31,201	65,556
April	57,561	20,787	28,430	67,317
May	65,900	28,621	25,276	64,325
June	64,338	42,166	20,935	54,621
½ year	54,134	24,536	28,412	61,356
July	39,510	57,821	18,461	47,201
August	34,012	59,142	17,115	41,308
September	29,935	50,742	19,753	38,964
October	30,679	43,754	20,800	37,848
November	31,898	36,174	21,042	36,782
December	33,149	38,131	17,615	31,625
Year	43,592	36,199	23,733	50,069

Production of Coke Pig Iron and Ferromanganese

Gross Tons

	Pig Iron*		Ferromanganese†	
	1934	1933	1934	1933
January	1,215,226	568,785	11,703	8,810
February	1,263,673	554,330	10,818	8,591
March	1,619,534	542,011	17,605	4,783
April	1,726,851	623,618	15,418	5,857
May	2,042,896	887,252	10,001	5,948
June	1,930,133	1,265,007	10,097	13,074
½ year	9,798,313	4,441,003	75,642	47,063
July	1,224,826	1,792,452	10,188	18,661
August	1,054,382	1,833,394	8,733	16,953
September	898,043	1,522,257	7,100	13,339
October	951,062	1,356,361	9,830	16,943
November	956,940	1,085,239	8,134	14,524
December	1,027,622	1,182,079	4,563	9,369
Year	15,911,188	13,212,785	124,190	136,852

*These totals do not include charcoal pig iron. The 1933 production of this iron was 32,941 gross tons.
†Included in pig iron figures.

Merchant Iron Made, Daily Rate

Tons

	1934	1933	1932
January	7,800	2,602	6,256
February	7,071	2,363	7,251
March	7,197	2,412	7,157
April	8,838	1,908	5,287
May	9,099	3,129	4,658
June	9,499	4,088	6,090
July	7,880	6,783	3,329
August	6,043	7,756	3,070
September	5,986	10,034	3,213
October	5,765	8,634	4,286
November	6,610	7,639	4,435
December	4,399	8,358	3,674

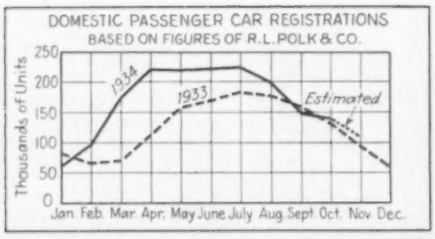
Production by Districts and Coke Furnaces in Blast

Furnaces	Production (Gross Tons) December (31 Days)	Production (Gross Tons) November (30 Days)	January 1 Number in Blast	January 1 Operating Rate, Tons a Day	December 1 Number in Blast	December 1 Operating Rate, Tons a Day
New York:						
Buffalo	59,340	65,748	4	2,340	3	1,770
Other New York and Mass.	2,715	20,530	0	....	1	175
Pennsylvania:						
Lehigh Valley	25,344	26,668	2	795	3	890
Schuylkill Valley	....	....	0	....	0	....
Susquehanna and Lebanon Valleys	2,163	18,672	0	....	1	620
Ferromanganese	....	....	0	....	0	....
Pittsburgh District	171,789	166,505	12	6,625	10	4,460
Ferro. and Spiegel	4,563	4,424	1	145	1	145
Shenango Valley	17,587	16,266	1	565	1	540
Western Pennsylvania	17,439	18,839	1	565	1	630
Ferro. and Spiegel	....	3,710	0	....	0	....
Maryland	45,935	38,715	3	2,085	2	1,290
Wheeling District	77,488	59,363	4	2,835	*3	1,980
Ohio:						
Mahoning Valley	101,291	78,375	7	3,940	3	1,635
Central and Northern	122,929	104,641	8	4,325	7	3,490
Southern	35,688	21,369	3	1,150	3	1,045
Illinois and Indiana	203,317	177,489	11	7,490	9	5,915
Mich. and Minn.	45,418	46,117	3	1,465	3	1,535
Colo., Mo. and Utah	15,370	18,885	2	590	2	630
The South:						
Virginia	....	....	0	....	0	....
Kentucky	12,867	12,407	1	415	1	415
Alabama	66,379	58,217	6	2,285	5	2,230
Ferromanganese	....	....	0	....	0	....
Tennessee	....	....	0	....	0	....
Total	1,027,622	956,940	69	37,615	59	29,395

Riverside No. 2 furnace of Wheeling Steel reported in last month in error.

Performance Featured In New Automobiles

THE performance and beauty in appearance of all cars, and especially those in the low-priced group, have reached a new zenith, said Austin M. Wolf, consulting engineer, in speaking at the "pre-view" of the New York Automobile Show, attended by some 300 members and guests of the Metropolitan Section of the Society of Automotive Engineers, Jan. 3. The significant developments of the year include the shifting of engine weight forward, new types of independent springing, narrow-shell radiators, the new steel roofs, high-compression cylinder heads, centrifugally-weighted clutch lever, "electric-finger" gear shifters and the use of new bearing alloys, he said. In discussing Mr. Wolf's address, Herbert Chase, consulting engineer, pointed out that independent springing has lost ground in the lowest price brackets in favor of more nearly conventional types using through axles and soft leaf springs both front and rear.



THIS WEEK ON THE A

Steel Demand Continues Urgent at Detroit As Production Schedules Rise

DETROIT, Jan. 8.

DETROIT is in the midst of a tumultuous period. Late in 1934 the automobile industry let its stocks of steel and of parts dwindle almost to the vanishing point. Now that every factory is straining to turn out cars in large volume and schedules have been stepped up, car manufacturers are pounding suppliers for immediate deliveries and often are making impossible demands.

The pressure is being felt most in flat-rolled steel. Many sheet mills are booked ahead for three or four weeks and, to their distress, have been forced to decline tonnage which processing departments in automotive plants must have during January. Some strip and bar mills have orders on hand which insure operation at full capacity for two to three weeks. The rush of automotive users to place steel business has given rise to fantastic stories about huge tonnages which mills have had to pass by, but these are mostly gross exaggerations.

Parts Manufacturers Active

The current boom in operations is not confined to steel makers. Practically all the stamping plants in southern Michigan, which normally furnish parts to the motor car industry, have all the business they can handle at the moment and overflow orders have been allotted to sheet metal fabricators in Cleveland and other cities outside this immediate area. Another bit of evidence of extraordinary activities in automotive circles is furnished by several parts manufacturers. Ordinarily these companies do machining and sub-assembly work as well as the final assembly of their products, but releases have been so heavy that they have had to farm out some of the machining and sub-assembly operations and devote larger space in their plants to final assembly.

January Production Still Unestimated

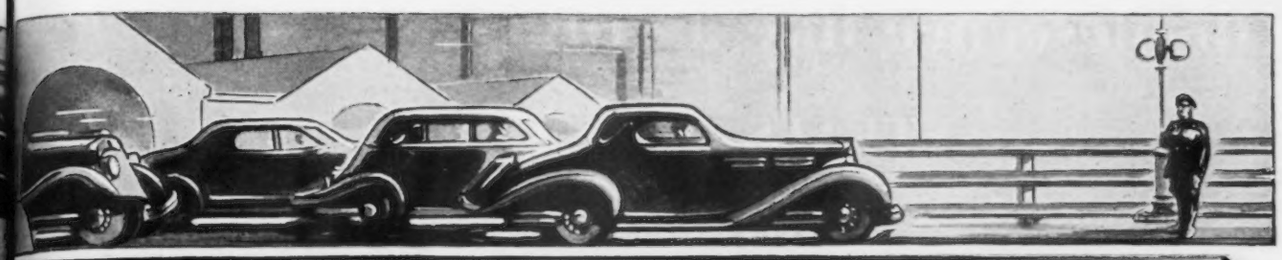
It is still too early to name a production figure for the industry for January. Car makers are shooting at long-range goals with odds against their attainment. General Motors hopes to make 106,000 units this month, Ford 110,000 and Chrysler 67,000. This would give the three leaders a total of 283,000 units. Add 10 per cent for the remainder of the industry, or 28,000, and the tentative schedules are above 300,000 units. But no one in Detroit entertains the thought that output this month will even approach that mark.

Some people, who more than once have seen the motor car industry rise suddenly to a production peak and then just as suddenly deflate its activities, are wondering whether automobile companies are trying to build more cars than the market warrants, with the possibility that the present flurry may not last into the spring. Such fears should be quickly allayed by an examination of the situation. With 1934 assemblies in the United States and Canada estimated at 2,875,000 units, even the more conservative automotive executives agree that output this year should be at least 3,300,000 units. That would mean a monthly production of 275,000 units evenly distributed over 12 months. Everyone knows, however, that operations are mostly confined to about 10 months out of the year. This would call for continuous assemblies of 330,000 cars each month for 10 months. With allowance made for seasonal factors, it is almost certain that instead of any letdown ahead, the industry is likely to have two months during the spring when its output will be more than 400,000 units a month. The peak month in 1934 was April with 373,108 units. The last time that production passed 400,000 cars was in May, 1930.

Labor an Important Factor

Continuation of the present expansion, of course, is dependent on the solution of labor disputes without resort to a strike. It is no secret that the United Automobile Workers' Federal Union, affiliate of the American Federation of Labor, will make a supreme effort to secure a public hearing at the time of the renewal of the automobile code Feb. 3. The federation is in open revolt against the Automobile Labor Board and no longer subscribes to the President's agreement of March 25, 1934, setting up the board. The peg on which the federation seems apt to hang its complaints against the industry is the report to be made late in January to President Roosevelt by the special commission headed by Leon Henderson, director of the NRA research and planning division, which is investigating ways and means of stabilizing automotive employment. The release of that report to the press probably will be the signal for the start of trouble making by the A. F. of L.

It has been suggested that the concern of automobile companies about boosting production rates partly arises from a desire to build as many cars as possible so that dealers will be well stocked in case a strike might occur. It is almost impossible to determine to what extent this consideration has influenced certain manufacturers. In some cases this factor



ASSEMBLY LINE

BY BURNHAM FINNEY

Detroit Editor, The Iron Age

probably is important. It has no bearing, however, on the Ford situation. No one familiar with the Ford Motor Co. anticipates labor trouble in its ranks. The most plausible explanation is that factories are desirous not only of filling current retail orders but also of stocking dealers in anticipation of the best spring business in five years. The general feeling on the part of dealers as well as manufacturers that sales will be good in the spring is likely to result in building up the largest field stocks in several years.

Model Changes Not Radical

After the claims of automobile companies regarding new models have been examined and the facts separated from the ballyhoo, and after one has had an opportunity to look over the cars, the difference between 1934 and 1935 models is by no means startling. There are instances in which a genuine improvement has been made in riding qualities. Probably the most radical change instantly apparent to the eye is the substitution of the turret top for the fabric top. From the standpoint of enhancing appearance and contributing to safety, this is the chief innovation of the year. Weight redistribution, permitting relocation of the rear seat ahead of the rear axle, is an outstanding engineering advance. Other improvements can be classified as minor.

The "bigger and better" slogan is being overworked as usual, but it can't be applied to many cars in the matter of wheelbase. In the low-priced field wheelbases are approximately the same as in 1934; manufacturers in the lower medium-price bracket have cut them down somewhat. Economies haven't been effected so much in what goes into and on cars as in manufacturing practices. Most important among these practices is standardization of parts. For example, one manufacturer with an eight and two sixes is using the same body on all three lines. Another with two lines of cars is putting the same engine into both. Lower unit costs are the result.

It can be said with authority that the average 1935 car costs less to make than the average 1934 car. Car makers will be able to take advantage not only of manufacturing ingenuity, but also of increased volume in their search for lower production expenses. With this prospect, the tendency on the part of some companies to raise prices seems questionable.

Low-priced car makers sprang a surprise when they failed to lower their factory prices to an appreciable degree. However, some people believe that what has occurred thus far is little more than a maneuvering for position at the beginning of a highly competitive year. Whether prices will stay where they are depends on what happens in the next 60 to 90 days. If it appears that the market is being restricted by prices which are too high, car makers won't hesitate to slash them. Both General Motors and Chrysler heaved deep sighs of relief when Ford announced prices with a cut on only two models. They were led to believe that a reduction of $20 to $25 was in order.

Expenditures to be Watched

As developments inside one of the larger corporations come to light, the fact becomes increasingly clear that the management is out to make a financial showing in 1935. It can produce cars for less money than during 1934 and anticipates a substantial increase in volume. Its expenditures for tools and dies have been very modest. It has given strict orders that no new equipment is to be bought, at least for the present. The only purchases allowed are those essential for proper maintenance and for repair parts. The reason for this policy is understood to be eagerness to show a large increase this year in earnings per car. Management was subjected to considerable critical scrutiny on the part of New York financial interests for its relatively poor earnings per car during the past year, and is said to have its eye on improvement of the market price of the corporation's stock this year. There is no better way to achieve this purpose than to earn more money.

February Schedules Higher

Tentative schedules of the industry for February, on the basis of reports from companies representing 90 per cent of the total, call for about 380,000 units. Ford is counting on 125,000 units next month, Chrysler 92,000 and General Motors 145,000. Chevrolet is reported to have set up a schedule of 70,000 Master jobs, 30,000 Standards and 15,000 trucks. All of these figures are merely tentative and subject to change, but indicate that the industry is thinking in terms of high production.

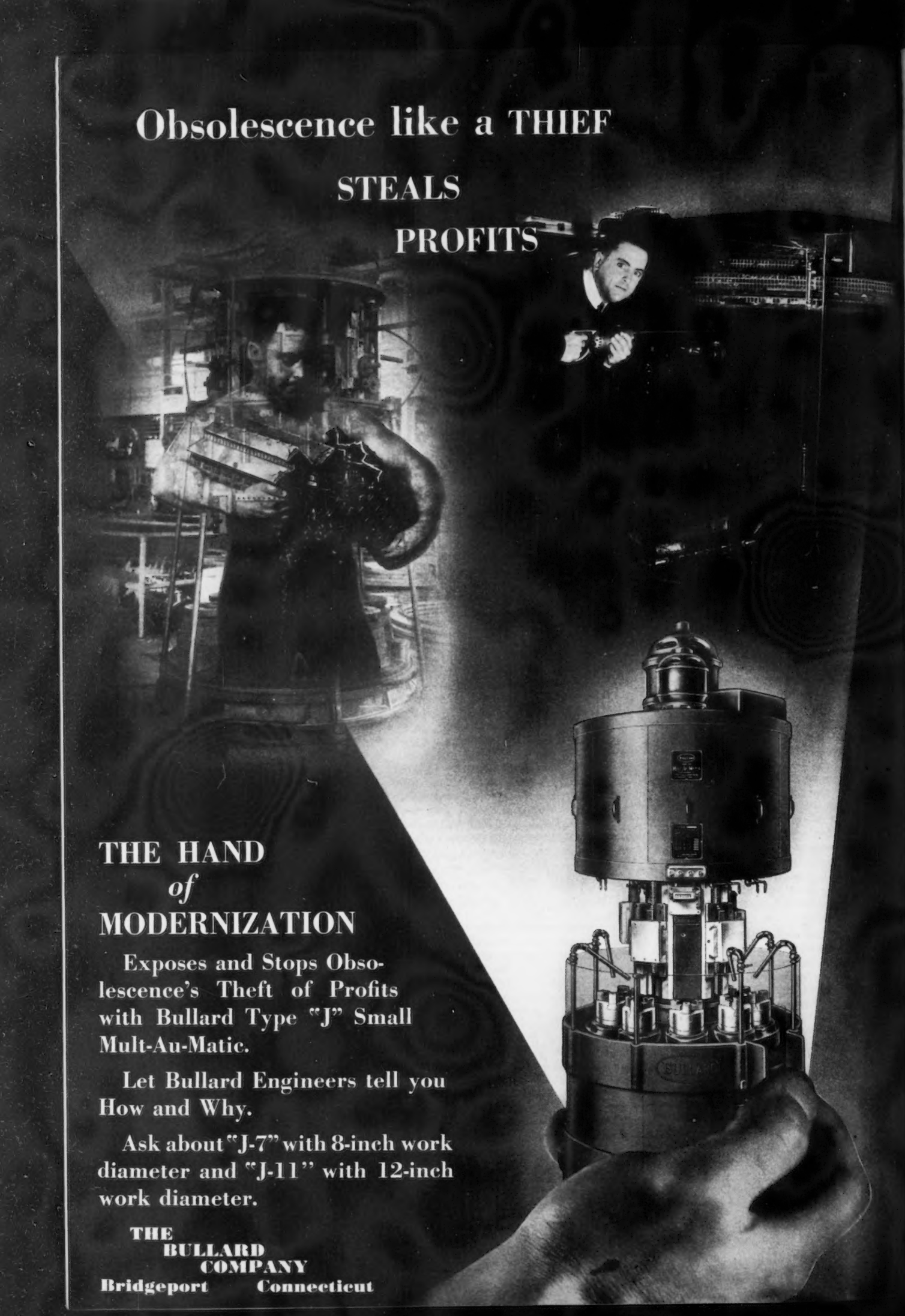
Keen observers give independent manufacturers little chance of making headway against the Big Three. All of them lost money the past year, but are attempting to stage a recovery in volume and in profits by increasing their lines in the lower-price ranges. The chief difficulty is to obtain enough good dealers to handle their products, for, after all, the volume of sales of any car manufacturer is governed largely by the number and strength of dealers. General Motors has further discouraged independent companies by enlarging its lines so that there isn't a price range in which it isn't represented by at least one make of car. In some cases there is an overlapping of prices within the corporation. Both Pontiac, in its de luxe six series, and the Oldsmobile six have coupes and sport coupes for $675 and $725 respectively. The Pontiac four-door sedan and touring sedan in the de luxe six are $25 less than the same models of the Olds six.

Detroit Notes

Ford is maintaining production at the Rouge plant at a rate of 5000 motors a day. . . . Hudson has announced that it aims to build at least 100,000 cars in 1935. . . . Motor car registrations in 1934 exceeded those of the preceding year for the first time since 1930.

Obsolescence like a THIEF

STEALS PROFITS



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THE BULLARD COMPANY
Bridgeport Connecticut

Steel Production in Further Rise to 44½ Per Cent

Scrap Also Advances—Automotive Industry Accelerates Its Operations—Labor Threat Is Only Cloud on Horizon

ANOTHER sharp gain in steel production and a further advance in scrap prices have given the iron and steel market a buoyancy that it has lacked since the first half of 1934. Ingot output has risen three and a half points to 44½ per cent of capacity, a rate which it did not attain last year until the third week in February. Scrap, as measured by THE IRON AGE composite for heavy melting steel, has been lifted from $11.75 to $12.33 a ton, its highest level since April, 1934.

Although the accelerating pace of automobile production accounts in large part for the current expansion of steel mill operations, the farm equipment industry continues to take more steel, tin plate specifications have improved, and sizable inquiries from the railroads have brightened the prospects for more active demand for heavier rolled products.

THE only cloud on the horizon, and one which has grown more threatening during the past week, is the disturbing outlook in industrial relations. The decision of the steel labor board ordering employee elections at two plants of the Carnegie Steel Co. has been challenged in petitions of employee representatives filed with Federal courts. One effect of this move will be to block the elections at least during the court proceedings, which will probably take two to three months, and it may eventually lead to a test of the constitutionality of the labor tribunal's decision. Meanwhile the labor board has ordered elections at several other steel company plants.

FEAR of labor difficulties also hangs over the automobile industry, but assumptions that the current spurt in motor car production is mainly in anticipation of possible strikes later in the year are not well founded. The most conservative estimates place American and Canadian production for this year at 3,300,000 cars, or 275,000 a month. Since operations are customarily confined to about 10 months, output during the active period should average well over 300,000 a month. That figure will probably not be attained in the current month, notwithstanding the rapidly increasing pace of operations, but tentative schedules for February call for close to 380,000 units. Ford's production this month promises to be the largest for any January since Model-T days and schedules call for an increase in output at Rouge in February to 6000 units a day from the present basis of 5000.

FARM equipment and tractor manufacturers look for the largest spring trade since 1930, with a probable gain of 40 per cent over 1934.

Heavier releases from can makers have raised tin plate output to 45 per cent of capacity, or 10 points above holiday schedules. The outlook for tin plate business this year is particularly favorable, since consumer carryovers on Jan. 1 were much lower than at the beginning of 1934.

RAIL and fastening inquiries now before the industry or in early prospect total 136,000 tons. Included are 44,000 tons for the Norfolk & Western, 19,000 tons for the Burlington, 51,000 tons for a larger Southern system, 20,000 tons for an Eastern road and 2000 tons for a New York subway.

The New York Central has taken bids or is about to take tenders on track depression and elevation work in New York calling for 14,000 tons of steel. Expenditures by the railroads for freight car repairs in 1935 will total $65,000,000, according to Washington advices.

Fabricated structural steel awards of 28,200 tons compare with 16,525 tons a week ago. New projects total 25,950 tons as against 7400 tons in the previous week. Plate lettings aggregate 6400 tons, with new inquiries accounting for 4800 tons. Pending sheet steel piling projects likely to be placed within the next three months total 25,000 tons.

STEEL output has risen two points to 27 per cent at Pittsburgh, five points to 50 per cent at Chicago, one point to 28 per cent in the Philadelphia district, six points to 56 per cent in the Valleys, four points to 69 per cent at Cleveland, and 10 points to 90 per cent in the Wheeling district. Operations are unchanged at 66 per cent in Detroit, at 41 per cent in Buffalo and at 29 per cent in the South.

THE IRON AGE composite prices for pig iron and finished steel are unchanged at $17.90 a ton and 2.124c. a lb. respectively.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Jan. 8, 1935	Dec. 31, 1934	Dec. 11, 1934	Jan. 9, 1934
Per Gross Ton:				
No. 2 fdy., Philadelphia	$20.26	$20.26	$20.26	$19.26
No. 2, Valley furnace	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti	19.13	19.13	19.13	18.13
No. 2, Birmingham†	14.50	14.50	14.50	13.50
No. 2 foundry, Chicago*	18.50	18.50	18.50	17.50
Basic, del'd eastern Pa.	19.76	19.76	19.76	18.76
Basic, Valley furnace	18.00	18.00	18.00	17.00
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	19.76
Malleable, Chicago*	18.50	18.50	18.50	17.50
Malleable, Valley	18.50	18.50	18.50	17.50
L. S. charcoal, Chicago	24.04	24.04	24.04	23.54
Ferromanganese, seab'd carlots	85.00	85.00	85.00	85.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$36.37½
Light rails, Pittsburgh	35.00	35.00	35.00	32.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	26.00
Sheet bars, Pittsburgh	28.00	28.00	28.00	26.00
Slabs, Pittsburgh	27.00	27.00	27.00	26.00
Forging billets, Pittsburgh	32.00	32.00	32.00	31.00
Wire rods, Pittsburgh	38.00	38.00	38.00	36.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.60

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.80	1.80	1.80	1.75
Bars, Chicago	1.85	1.85	1.85	1.80
Bars, Cleveland	1.85	1.85	1.85	1.80
Bars, New York	2.13	2.13	2.13	2.08
Plates, Pittsburgh	1.80	1.80	1.80	1.70
Plates, Chicago	1.85	1.85	1.85	1.75
Plates, New York	2.08	2.08	2.08	1.98
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.70
Structural shapes, Chicago	1.85	1.85	1.85	1.75
Structural shapes, New York	2.05¼	2.05¼	2.05¼	1.95¼
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh	1.85	1.85	1.85	1.75
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.40

Finished Steel

	Jan. 8, 1935	Dec. 31, 1934	Dec. 11, 1934	Jan. 9, 1934
Per Lb.:	Cents	Cents	Cents	Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.25
Hot-rolled annealed sheets, No. 24, Gary	2.50	2.50	2.50	2.35
Sheets, galv., No. 24, P'gh	3.10	3.10	3.10	2.85
Sheets, galv., No. 24, Gary	3.20	3.20	3.20	2.95
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.75
Hot-rolled sheets, No. 10, Gary	1.95	1.95	1.95	1.85
Wire nails, Pittsburgh	2.60	2.60	2.60	2.35
Wire nails, Chicago dist. mill	2.65	2.65	2.65	2.40
Plain wire, Pittsburgh	2.30	2.30	2.30	2.20
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.25
Barbed wire, galv., Pittsburgh	3.00	3.00	3.00	2.85
Barbed wire, galv., Chicago dist. mill	3.05	3.05	3.05	2.90
Tin plate, 100 lb. box, P'gh.	$5.25	$5.25	$5.25	$5.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh.	$13.25	$13.25	$13.25	$12.50
Heavy melting steel, Phila.	**11.00**	10.75	10.75	11.75
Heavy melting steel, Ch'go.	**12.75**	11.25	10.00	10.50
Carwheels, Chicago	**12.00**	11.50	10.50	10.50
Carwheels, Philadelphia	10.75	10.75	10.75	11.75
No. 1 cast, Pittsburgh	12.75	12.75	12.75	11.25
No. 1 cast, Philadelphia	11.00	11.00	11.00	12.50
No. 1 cast, Ch'go (net ton)	**10.75**	10.25	9.50	9.50
No. 1 RR. wrot., Phila.	11.25	11.25	11.25	11.00
No. 1 RR. wrot., Ch'go (net)	**11.00**	10.00	8.75	8.75

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.85	$3.85	$3.85	$3.75
Foundry coke, prompt	4.60	4.60	4.60	4.25

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery‡	8.75	8.75	8.75	7.75
Lake copper, New York‡	9.12½	9.12½	9.12½	8.00
Tin (Straits), New York	**50.87½**	50.75	51.05	52.00
Zinc, East St. Louis	**3.75**	3.72½	3.70	4.25
Zinc, New York	**4.10**	4.07½	4.05	4.60
Lead, St. Louis	3.55	3.55	3.35	3.90
Lead, New York	3.70	3.70	3.50	4.00
Antimony (Asiatic), N. Y.	13.87½	13.87½	13.75	7.25

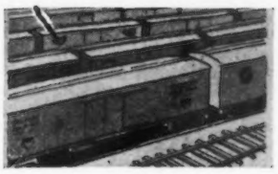
On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables. ‡Blue Eagle copper.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
Jan. 8, 1935	2.124c. a Lb.	$17.90 a Gross Ton	$12.33 a Gross Ton
One week ago	2.124c.	17.90	11.75
One month ago	2.124c.	17.90	11.33
One year ago	2.008c.	16.90	11.58
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1934	2.199c., April 24;	2.008c., Jan. 2	$17.90, May 1;	$16.90, Jan. 27	$13.00, Mar. 13;	$9.50, Sept. 25
1933	2.015c., Oct. 3;	1.867c., April 18	16.90, Dec. 5;	13.56, Jan. 3	12.25, Aug. 8;	6.75, Jan. 3
1932	1.977c., Oct. 4;	1.926c., Feb. 2	14.81, Jan. 5;	13.56, Dec. 6	8.50, Jan. 12;	6.42, July 5
1931	2.037c., Jan. 13;	1.945c., Dec. 29	15.90, Jan. 6;	14.79, Dec. 15	11.33, Jan. 6;	8.50, Dec. 29
1930	2.273c., Jan. 7;	2.018c., Dec. 9	18.21, Jan. 7;	15.90, Dec. 16	15.00, Feb. 18;	11.25, Dec. 9
1929	2.317c., April 2;	2.273c., Oct. 29	18.71, May 14;	18.21, Dec. 17	17.58, Jan. 29;	14.08, Dec. 3
1928	2.286c., Dec. 11;	2.217c., July 17	18.59, Nov. 27;	17.04, July 24	16.50, Dec. 31;	13.08, July 2
1927	2.402c., Jan. 4;	2.212c., Nov. 1	19.71, Jan. 4;	17.54, Nov. 1	15.25, Jan. 11;	13.08, Nov. 22

Pittsburgh Steel Output Rises to 27 Per Cent



Valley Operations Are Up Six Points to 56 Per Cent While Wheeling District Rate Mounts to 90 Per Cent

PITTSBURGH, Jan. 8.—Ingot production in the Pittsburgh district this week will average two points higher at 27 per cent of capacity. Output in the Valleys and nearby northern Ohio mills is six points higher at 56 per cent, while in the Wheeling district the current rate of 90 per cent reflects a 10-point increase. Heavier ingot output in these districts is based largely on the expanding steel requirements of the automobile industry and a moderate pick-up in tin plate releases.

The Pittsburgh district, which is running well behind all other steel producing areas in the country because of its preponderance of heavy hot-rolled capacity, is not benefiting proportionately from increased activity at automotive centers. Soft steel bars, alloy bars, sheets and strip are in better demand from motor car makers, but miscellaneous steel requirements show no expanding tendencies. Nor are the prospects bright for a material increase in structural and rail business. The outlook for tin plate production, however, is favorable, as consumer carry-overs on Jan. 1 are reported to be sharply lower than those at the beginning of last year.

Finishing mill schedules have forged ahead since the holiday period. Sheet mill production has risen to 55 per cent, while strip steel output this week will average about 45 per cent. Tin plate mills are engaged at 45 per cent, or 10 points above holiday schedules. Wire and tube mills are maintaining fair operating schedules. Two blast furnaces in the Pittsburgh district have resumed in the past seven-day period.

Pig Iron

Demand for small lots has increased since the beginning of the year, and several round-lot tonnages have been booked by producers in this district. Mill equipment makers are melting on steady schedules, but most of this class of pig iron business is denied merchant furnaces owing to reciprocal arrangements. Little first quarter contracting has been reported, the bulk of current bookings being for early delivery.

Semi-Finished Steel

With non-integrated mills on more regular schedules after the holiday period, the movement of semi-finished grades has been accelerated in some instances. Brisk activity among some detached tin plate mills has stimulated a heavier demand for sheet bars, which also are in better demand for sheet mills. Skelp demand is on an even keel. Forging billets are enjoying a sustained interest from forging shops engaged on automotive requirements.

Rails and Track Accessories

The Norfolk & Western will take bids until Jan. 8 for 32,000 tons of 130-lb. steel rails and on a sizable tonnage of spikes, tie plates and other track fastenings. Miscellaneous inquiry for trackwork material is slightly heavier, but the general tone of this market continues to be listless.

Bolts, Nuts and Rivets

Anticipatory covering late in December against higher prices has caused a lull in general demand. Jobbers were fairly active in the December movement, and warehouse stocks must undergo a steady liquidation before replenishment buying can be expected. Measured by general prospects in this market, significant buying probably will be deferred until the quarter is well under way. Automotive and railroad demand overshadow other market influences for the moment. Prices have generally overcome the weakness characteristic of last quarter, and current discounts are fairly well recognized.

Reinforcing Steel

Although a substantial tonnage pends for various public works projects, little tonnage had reached producers in this district in the first week of the new year. New specifications are seasonally limited, and no real impulse to greater activity is in sight until spring road and construction work gets under way. Federal spending still is the chief hope for heavy tonnage. In the immediate district, the Allegheny County Authority is still in the early stages of its extensive public works program, and reinforcing bars for bridge and tunnel construction and repairs will not be ordered for some months.

Bars

Round tonnages for automotive consumption are aiding merchant steel bar schedules this month. Such tonnage, however, is being placed intermittently, and a more regular demand is in prospect later in January. Alloy bars also are favorably influenced by automobile needs. Ambitious programs of farm implement makers for this year have not been launched to the point where soft steel bars have benefited measurably, but the promise of substantial business from this source is expected to be fulfilled soon.

Cold-Finished Steel Bars

Automotive releases are rather spotty, but, in the aggregate, such tonnage is a boon to mill schedules. Miscellaneous requirements are well sustained. Demand for agricultural implement manufacture is expected to expand gradually during January and February. A diminution is noticeable in takings by office equipment makers. Jobbers still are hesitant, but a latent warehouse demand is expected to be uncovered early in this quarter.

Plates and Shapes

General requirements for plates are rather narrow at the outset of the year. A few inquiries were carried over from December for barge construction, but promise of actual tonnage is still vague. Railroad and tank specifications are at a minimum. By contrast, the structural steel market is somewhat brighter. Fresh inquiries in the past week reported in this district were not impressive, but awards were noticeably heavier. The American Bridge Co. has received a contract for 1300 tons for the Richmond, Va., parcel post building. The Fort Pitt Bridge Works Co. will supply 3285 tons for the Lorain viaduct at Cleveland. Backlog tonnages are being diminished rapidly, and some fabricating shops will soon revise schedules downward unless substantial tonnage appears in the meantime.

Wire Products

The bulk of current demand emanates from automotive centers. Jobbers have not entered the market with the celerity expected, and with maximum prices virtually assured for the entire first quarter, little incentive is offered for heavy replenishment buying. Warehouse covering thus far in January has been largely restricted to piecing out stocks.

Tubular Products

Although the Lone Star Gas Co. is reported to be tentatively considering a 100-mile pipe line in Anderson

County, Tex., it is considered doubtful that the proposal will be carried out. It is believed more likely that the company will use old lines to meet its present needs. Although the use of reclaimed pipe is not considered economical in most instances, such procedure greatly reduces cash outlay. The line pipe market otherwise lacks important features. The movement of oil-country goods has been sustained since December, while requirements for standard pipe are similarly holding their own. Mechanical tubing is in good demand for automotive application. Occasional small lots of commercial boiler tubes and locomotive boiler tubes are reported.

Sheets

Sheet mill production advanced sharply in the past week, and in the current period will average probably 55 per cent of capacity. The chief impetus for this upswing is furnished by automotive specifications. Black sheets are in steady demand from barrel makers, while miscellaneous requirements are not losing ground. Jobbers are not lively participants at present.

Tin Plate

Satisfactory releases for general line can manufacture have stimulated a recovery in this market from the holiday lull. Average output in the tin plate industry in the current week is estimated at 45 per cent. Some specifications are traceable to Federal emergency meat-packing activity, but this class of business is intermittent. Consumer carry-overs from 1934 are believed generally to be drastically lower than those from 1933. The healthier position of consumer stocks thus promises a steadier demand in the current year, based on the premise that consumption and production will be more closely related than in 1934.

Strip Steel

A marked improvement in activity in this market has followed the holiday period. Although demand is somewhat unbalanced, with automotive tonnage predominating, the general character of consumer interest is encouraging. With moderate miscellaneous tonnage drifting in, some mills are paced at about 45 per cent of capacity. The general average for the strip industry is estimated at 40 to 45 per cent. Requirements of agricultural implement makers are important prospects for expanding activity later in January. Jobbers reflect greater disposition to cover, but their participation since the year-end has not resulted in important aggregate tonnage.

Coke and Coal

The flood of Southern by-product and Texas petroleum coke in Eastern markets has retarded the movement to the East of beehive coke from this district. For Eastern delivery Connellsville beehive coke at present is about $1.25 a ton higher than the seaboard quotation for petroleum and by-product coke. Heating coke and domestic grades are rather quiet, owing to mild weather. The bituminous coal market is quiet. Disregard of code price provisions is widening and some producers consider Government intervention inevitable before the present muddle on prices is overcome.

Scrap

Consumer interest has reappeared after the holiday lull. Demand cannot be considered strong in the immediate Pittsburgh district however, and the general market reflects mixed tendencies with regard to prices. Ordinary No. 1 heavy melting steel has been sold in minor quantities at less than the current quotational spread of $13 to $13.50, but these transactions have usually entailed material of a more or less distress character. A round lot of ordinary No. 1 steel has been sold at $13.25, delivered. Some mills are offering only $13, delivered, but large dealers are showing some resistance and are not inclined to push sales at below $13.50. The market for heavy melting steel is deriving some strength from a good demand for high-grade railroad steel, which is commanding a substantial premium over ordinary material. Despite the softness in ordinary No. 1 steel a strong undertone continues because of buoyant markets in practically all other districts. No. 1 heavy melting steel at Youngstown is quotable at around $13. Railroad specialties are weaker in the absence of mill demand. The Pennsylvania Railroad list, which will close this week, covers 20,500 tons, including 7350 tons of No. 1 steel.

To Extend Galvanized Sheet Exhibits

THE American Zinc Institute has extended its schedule of exhibits of "Seal of Quality" 2-ounce coated sheets to include a number of important winter meetings. The following presentations have been scheduled:

Jan. 14-18, Purdue Farm Conference, Purdue University, LaFayette, Ind.

Jan. 21-25, Pennsylvania State Farm Products Show, booths 66 and 85, Farm Show Building, Harrisburg, Pa.

Jan. 28-Feb. 1, Ohio State Farmers Week, Columbus, Ohio, Agricultural Engineering Building.

Feb. 4-5, Sheet Metal Contractors Association of Wisconsin, Republican Hotel, Milwaukee.

Jan. 29-Feb. 9, Florida Fair, Tampa, Fla., space 7, Brorein Hall.

Feb. 12-14, Illinois Lumbermen's Convention, Stevens Hotel, Chicago.

Steel Demand Improves In South

BIRMINGHAM, Jan. 10.—Foundries have been slow to resume their pre-holiday schedules, and consequently the pig iron market has had little activity since the first of the year. Bookings and shipments have both been below December levels, but a turn upward is expected during the present week. Local producers express the belief that substantial improvement will be felt in the pig iron market during the first quarter.

The price remains at $14.50 and furnace operations are unchanged, with six active stacks.

Steel bookings are better than those of pig iron, and a fair volume of orders was obtained during the past week. Part was hold-over business from the last part of December, which was not placed until after inventory. Railroad inquiry is more active and some new tonnage is expected within the next several weeks.

Open-hearth operations are unchanged. Seven units were worked last week, and the same number is scheduled this week.

Niles Gets Large Order From Japan

MITSUBISHI SHOJI KAISHA, LTD., Tokyo, through its New York office, has placed an order with Niles-Bement-Pont Co., New York, for plate glass manufacturing machinery. The equipment will be built at the Hooven, Owens, Rentschler plant, Hamilton, Ohio.

The order is reported to amount to several hundred thousand dollars and is probably the largest yet placed in this country for machinery of this type for shipment abroad.

Steel Casting Orders Lower in November

WASHINGTON, Jan. 8.—November orders for commercial steel castings totaled 21,552 net tons, compared with 24,327 tons in October, according to the Bureau of the Census. In the 11 months ended with November, bookings aggregated 406,819 tons, against 254,619 tons in the corresponding period of 1933.

November output totaled 25,799 tons, compared with 29,142 tons in October and in the 11-month period production aggregated 426,171 tons, against 253,960 tons in the corresponding period of 1933.

Production Increases Five Points To 50 Per Cent at Chicago

Automobile and Implement Demand Is Main Source of Tonnage—Burlington to Buy Rails—Scrap in Sharp Advance

CHICAGO, Jan. 8.—Ingot output has registered a sharp gain and now stands at 50 per cent of capacity, which is the highest point reached since last June, when production crossed the 50 per cent line but was on its downward path.

This gain is shared in by all mills but its scope is narrow as to products that are desired by consumers. Automobile plants account for most of the tonnage now moving and from all indications their requirements have not reached their maximum. Farm implement manufacturers are broadening their activities.

The outlook for railroad buying and building construction is drab except for the prospect that the Burlington will soon enter the market for 15,000 tons of rails. The railroads and contractors are watching the interest the Government is taking in the matter of grade crossings. Structural steel, reinforcing bars, woven wire fencing and road guards are the steel items that would be required in quantity.

From the viewpoint of miscellaneous demand there is a decided change for the better, and there is growing evidence that few consumers can or are now willing to depend on such stocks as they may have on hand. It is evident that the stocks acquired last June have been largely liquidated.

The scrap market remains very strong and the prices that brokers are willing to pay point to higher quotations to consumers. Most grades are in good demand and there are evidences of shortages here and there.

Pig Iron

Shipments in the opening week of January are practically double those in the corresponding period of December. Sellers are of the opinion that January will be at least 40 per cent better than December, which did not show a drop in shipments as is usually the case. Sentiment is swinging in favor of commitments to cover the remainder of the first quarter, and books are growing.

Bars

Demand is broadening in practically all directions and mills have good schedules, though new buying remains more or less on a week-to-week basis, determined by the way business flows to ultimate consumers. Chicago mills have substantial releases from automobile plants, which so far have come to the Middle West for part of their needs for initial production schedules. It is expected by the trade that regular production plans will be known in a short time and that then the steel used in automobile construction will draw much more heavily against mill capacity. Agricultural implement manufacturers are expanding their operations.

Plates

This market remains very thin and prospects are not any too bright. Plate makers can still count on furnishing some tonnage for Mississippi River dams and a municipal water tank here and there. It is understood that the Illinois Central has had a $2,000,000 loan approved by the Interstate Commerce Commission and will use the funds to rehabilitate cars and locomotives.

Structural Material

An encouraging sign in a market that otherwise is very dull is the life that is beginning to be shown by public utility companies which here and there are starting to spend money for needed improvements. Other phases of the market are much as they have been for many weeks. Chicago fabricators are centering attention on State bridge programs and the Mississippi River dams. Bids will be taken Jan. 9 at Rock Island, Ill., on the Guttenberg, Iowa, dam.

Cast Iron Pipe

This market is experiencing the usual post-holiday lull, when few new projects appear and old plans hang fire. However, business should become more brisk after the middle of the month. Shipments to points in this section are off rather sharply because of cold weather. Foundry books are of good size and sellers look for a heavy movement by the first of March. Sellers expect a good first half of the year, though they realize they must depend heavily on Government spending.

Reinforcing Bars

Transactions are at low ebb, as is usually the case for several weeks after the winter holidays. A large tonnage of reinforcing bars is needed by road contractors who will not require shipments until spring. However, frequently, a number of them begin to buy late in January and in early February. Housing projects scheduled for Chicago are still in the preliminary stage, but at Atlanta, Ga., materials are now being ordered. Private work in sight is not encouraging, but estimators are being flooded with post office plans each of which calls for 5 to 20 tons of bars.

Rails

The Burlington will purchase about 15,000 tons of rails, most of them for use on the lines west of Omaha, Neb. About 11,000 tons will be of 112-lb. section and 4000 tons will be of 90-lb. weight.

Cold-Rolled Strip

Automobile producers have completed purchases for initial production schedules and are expected to enter the market soon for needs for regular production.

Sheets

Miscellaneous demand is much improved. Users who have been shearing to size from their stocks now find the business view clear enough so that they want to hold their stocks and this is forcing them into the market. Shipments to automobile plants are in good volume and one sheet mill unit here is operating at capacity.

Wire Products

Output has been raised to 40 per cent of capacity, and new buying and specifications point to a further gain. The bulk of outgoing tonnage is moving to manufacturing plants. Jobbers are ordering only to fill bare shelves. The railroads are awaiting the Government's plans for overhead crossings, which will take an attractive tonnage of woven wire fencing.

Coke

December prices for by-product foundry coke have been carried forward for deliveries in January. Shipments continue to climb.

Scrap

Prices continue to push to higher levels and there still is no sign of a halt. The urge back of this price movement is greater demand for the products of the steel mills, as well as the fact that important grades are not flowing as fast as is normally expected in a market of this kind. Dealers are firm in their opinion that acute shortages exist, though they may overlook the fact that many producers, notably the railroads, are holding supplies for higher prices. A stabilizing possibility may prove to be the acceptance by local mills of automobile scrap that has been accumulating in liberal quantities in local dealers' yards.

Steel Demand Shows Further Gain in New York District

Demand for Tin Plate Improves—Railroads Enter Market for Structural Work and Rails—Southern Road Wants 51,000 Tons of Rails

NEW YORK, Jan. 8.—Tin plate is more active both in terms of specifications and contracting, and inquiry from the railroads has improved. In addition, finished steel demand in general has picked up, reflecting a removal of the restraints that customarily hold down orders at the year-end.

The New York Central is taking bids today on 2000 tons of steel for underground work between Forty-second and Fifty-third Streets in Manhattan. It is also asking for revised bids on 2000 tons for similar work between Fifty-third and Sixty-third Streets, and on Jan. 15 will receive tenders on 8000 to 10,000 tons on elevated work between Seventy-second and Seventy-ninth Streets.

Prospective rail business from the carriers is of promising proportions. The Interborough Rapid Transit Co., New York, is in the market for 2000 tons. A road with headquarters in the East will apply for PWA funds to finance the purchase of 20,000 tons of rails and fastenings for use on the western end of its line. A Southern railroad system is inquiring for 51,000 tons of rails and accessories.

The Lehigh Valley has finally placed formal orders for 250 70-ton gondola cars with the Bethlehem Steel Co.

Frederick Snare Corpn., New York, is about to place close to 5000 tons of steel for the Tygart River dam, Grafton, W. Va. Included are 1500 tons of reinforcing bars, 1500 tons of sheet steel piling and 1800 tons of structural shapes.

Pig Iron

There is a better sentiment among founders, but the market is still feeling the effect of a widespread hesitancy on the part of buyers about purchasing for first quarter delivery. Only 1500 tons of new business has been placed since the turn of the year, and no large increase in inquiry is expected until after the inventory period. Even then the demand for castings will have to improve considerably before sales of iron will reach a satisfactory level. No base price on low phosphorus iron has been filed this quarter at Johnson City, Tenn., and western business in this grade is being handled on a Steelton, Pa., base. The Johnson City furnace has been out of blast for three years, and most of the stock there has been liquidated.

Reinforcing Steel

No business of any size was placed during the past week. However, distributers are looking forward to securing good tonnages when general contractors for New Jersey and New York highway projects cover their requirements on contracts which have been let. At least 1500 tons is active in the former State, and about 500 tons for New York State work should be placed in the next two weeks. Other projects which are still pending are 150 tons for New York Central Railroad track improvements at New York, and about 625 tons for piers of the Tri-Borough Bridge at New York.

Scrap

The major brokers in this area have cleaned up most of their old export contracts, and the market appears more stable than in previous weeks. Foreign melters apparently are willing to meet higher offers to a limited extent. Several fair tonnages have been placed at a level over $1 a ton higher than was available a month ago. At present boats are loading steel and cast grades for England, Italy and Japan. Steel is being purchased alongside barge at $8.75 and $7.25 for No. 1 and No. 2, respectively, with every indication that these offers may be advanced an additional 25c within the next few weeks. Likewise the nominal price for car loading has advanced 25c. on the strength of prices in the Pittsburgh area, although practically no material has moved from northern Jersey points into domestic consumption. The firm condition of the export market is also reflected in 50c. and 25c. advances in heavy breakable cast and No. 1 machinery cast respectively. Inasmuch as some interests are attempting to curtail scrap exportation, the New York Chapter of the Institute of Scrap Iron & Steel, Inc., has adopted a resolution to fight any move which might result in a restriction of scrap shipments abroad.

Canadian Steel Industry Showed Large Gains In Year Just Ended

TORONTO, Jan. 8.—The Canadian iron and steel industry showed general expansion in business and operations during the year 1934. Some branches advanced as much as 100 per cent above the level of the year immediately preceding and 200 per cent over 1932.

Iron and steel production was the principal barometer on which to base the trend for the year. During the year pig iron output amounted to approximately 396,000 tons against 227,317 tons in 1933 and 144,130 tons in 1932. Steel ingot production at 736,203 tons, compared with 394,059 tons in 1933 and 312,360 tons in 1932.

Canadian railroads played a very small part in the upswing in business for the steel industry during the period under review, although some of the steel plants were enabled to speed up operations and maintain a steady production schedule as a result of orders for steel rails awarded late in 1933. A stronger export demand for steel existed and a few good rail contracts were placed with Canadian

CANADIAN IRON AND STEEL PRODUCTION
(Gross Tons)

	Pig Iron	Steel Ingots	Steel Castings	Ferroalloys
1923	880,018	839,710	45,060	29,961
1924	593,024	625,175	25,515	26,400
1925	570,397	733,855	18,840	25,709
1926	737,503	745,550	33,338	57,416
1927	707,697	867,928	39,710	56,230
1928	1,037,727	1,190,001	44,718	44,882
1929	1,090,244	1,309,543	70,145	80,010
1930	747,178	957,430	54,313	65,223
1931	420,038	664,826	37,055	46,764
1932	144,130	312,360	22,915	15,487
1933	227,317	394,059	15,920	30,133
(a)1934	396,000	736,200	21,000	32,400

(a)—December production figures estimated.

mills by the South African Government. In addition some large tonnage orders for steel were awarded to Canadian producers by British interests.

It is anticipated that Canadian railroads will play a more important part in industrial expansion during 1935. Towards the close of last year announcement was made from Ottawa to the effect that, seeking to make profitable capital improvements and to give needed stimulation to the heavy industries, railroad companies have made a proposal to the Government under which $26,000,000 may be spent on new rolling stock and general equipment renewals in 1935. In this connection it is understood that about $20,000,000 will be expended by the Canadian Pacific and the remainder by the Canadian National.

Speeding up of operations in the automotive industry was a large contributing factor to the betterment in the steel industry last year and substantial orders originated from this source. It is stated that the various companies associated with the production of automobiles, trucks, etc., are preparing for another big year and heavy purchases of steel, sheets, and general supplies will develop early this year.

In addition much of the improvement that took place in industry last year was directly or indirectly due to the sensational boom in the mining fields of the country. As a result of this record breaking activity millions of dollars was spent for tools, machinery and general equipment, while other substantial contracts are pending. Production from the mineral industry of Ontario alone last year had a total of approximately $136,000,000, indicating just this much new wealth to the Dominion.

Building trades showed improvement of about 75 per cent over the previous year, but most of this was in the way of small building construction. Only a small number of large buildings were erected in 1934 with the result that the demand for structural steel showed little change from the preceding year, although sales of builders' hardware were sharply higher.

Scrap Prices Up At Detroit

DETROIT, Jan. 8.—Scrap prices have advanced 25c. to $1 a ton. Both heavy melting steel and hydraulic bundles are up 50c., while sheet clips, because of the strong demand in the Valley for this item, have risen $1. Although steel operations in this district have increased sharply in recent weeks, mills have a plentiful supply of old material on hand and fresh buying is lagging.

Cleveland Rate Is Up Four Points to 69 Per Cent

Pressure for Steel on Part of Automobile Industry Is Unabated—Scrap Prices Rise 50c to $1 a Ton—Blast Furnace Is Lighted

CLEVELAND, Jan. 8.—Orders for finished steel from automobile manufacturers and parts makers continue heavy, and the pressure for deliveries is unabated. Parts makers are being crowded for shipments of finished parts and they in turn are pushing the mills for deliveries of steel. The rush for material from this field at the moment is a reminder of pre-depression days.

Ingot output in the Cleveland-Lorain territory increased this week four points to 69 per cent of capacity, a rate that was equaled in 1934 only during three weeks in the early part of the year. Of 32 open-hearth furnaces in active plants in the territory only two are idle. One local steel plant kept its open-hearths in operation Sunday. The Corrigan, McKinney Steel Co. this week blew in a third blast furnace.

Sheets and steel bars, both carbon and alloy, are the two products that are in heavy demand. Cold-finished steel bars are moving in good volume to automobile parts makers, and manufacturers' wire has picked up.

Demand for both bars and sheets from miscellaneous consumers has increased. Refrigerator and washing machine manufacturers are stepping up production of new models and ordering more steel, and other consumers with the start of the new year are replenishing their depleted stocks. Agricultural implement manufacturers are getting busier and are ordering steel more freely than for some time.

Railroad inquiry is lacking in this territory, but some activity is expected in this field when budgets are approved. Little activity is in immediate prospect in the building field. The scrap market is buoyant, with price advances of 50c. to $1 a ton.

Pig Iron

New demand is holding to the recent fair volume. While quite a few orders are coming from miscellaneous sources, by far the greater part of the business is from automobile foundries and parts makers. Orders from agricultural implement manufacturers have gained. One Lake furnace interest sold 10,000 tons during the week, including two lots to automobile plants of about 2000 tons each. Buyers of large lots are issuing shipping orders for part of their iron and will take the remainder during the balance of the quarter. However, few foundries appear to be covering for their entire first quarter requirements. The Corrigan, McKinney Steel Co. this week blew in a blast furnace. It is now operating three out of four stacks.

Sheets

New business continues to come from the automotive industry in fairly heavy volume, and buyers are crowding mills for shipments of considerable of the steel, although they have placed some specifications for early February delivery. The flow of business from this source is steadier than recently, now that the automobile companies are getting their production schedules lined up. Good orders are coming from manufacturers of refrigerators and washing machines. Sign manufacturers are also buying sheets, and some new demand has developed from steel barrel manufacturers. Nearly all consumers who put in large stocks at the end of the second quarter and who recently have been placing fill-in orders for sizes not in stock have started the year with their old stocks used up. The local mill is operating at 65 per cent of capacity this week.

Strip Steel

This product is less active than sheets. Not much new business came during the week from automobile parts makers who had previously placed heavy specifications, and some of the large parts-making plants appear to be ahead of the automobile manufacturers in production. Some new tonnage came from stove manufacturers during the week.

Bars, Plates, and Shapes

The Lorain Road bridge, Cleveland, requiring 3050 tons of structural steel and 300 tons of reinforcing bars, has been awarded to the Fort Pitt Bridge Works. A Pitts-

burgh district mill will supply the steel. Bids for 1100 tons of reinforcing bars for the Muskingum Valley conservancy project were opened in Zanesville, Ohio, yesterday. There were 34 bidders. Little construction work is pending. Structural shapes and plates are not very active.

Scrap

Prices have again been marked up, the advance being $1 a ton on heavy melting steel and 50c. a ton on other steel-making and on blast furnace grades. Several thousand tons were purchased here during the week by a Cleveland consumer at $11.50 for No. 1 heavy melting steel and $8 for blast furnace scrap. This is an advance of 75c. a ton over the price paid by the same consumer for heavy melting steel two weeks ago. The New York Central Railroad sold several thousand tons of No. 1 heavy melting steel scrap at a reported price of $13, delivered Youngstown. With increased automobile production schedules, scrap lists of the Michigan automobile companies for January were larger than for some time and this scrap is reported to have brought very good prices.

Scrap Advances At Buffalo

BUFFALO, Jan. 8.—The pig iron market is good in spots, with shipments holding up unusually well. Sales are in fairly sizable lots. Much of the iron being sold today is going to foundries allied with the automobile business, but a fair share is being consumed by other melters. Producers are very hopeful of continued good business throughout the winter.

Republic Steel Corpn. has lighted its second blast furnace, after maintaining a single one in operation since the middle of last year.

The Lackawanna plant of the Bethlehem Steel Corpn. continues to operate nine open-hearth furnaces; Republic, five, and Wickwire-Spencer, one. The Seneca sheet division of Bethlehem remains on a 50 per cent basis.

A Buffalo company will fabricate 122 tons of steel for a highway bridge at Pulaski, N. Y., and it is expected that the steel award for the new police headquarters job at Buffalo will be announced within the next two weeks. A State bridge in Delaware and Otsego counties will require 250 tons of steel. This is reported to have gone to a Buffalo fabricator.

The scrap market continues firm. A dealer who is reputed to have an order for No. 1 heavy melting steel at $12 and No. 2 at $11 is reported to have purchased at least one lot of No. 2 steel at $10.50, and some No. 1 at $11.50. No. 1 steel has been shipped out of Syracuse for $13.75, Pittsburgh. Sales of low phosphorus at around $14 are reported.

Export Scrap Higher At Boston

BOSTON, Jan. 8.—Exporters have advanced their buying prices 50c. a ton on No. 1 heavy melting and No. 2 steel, delivered local army base, and there has been a corresponding advance in the market for T-rails. The market for No. 1 and 2 steel for Pennsylvania delivery is no higher, however, as only steel turnings, bundled skeleton and similar material are going to that State and they are moving in limited quantities. No steamers are loading here this week, but exporters are endeavoring to secure space for immediate loading, being somewhat apprehensive of a possible embargo. A steamer is loading 5000 tons at Providence, R. I., for an unknown destination. The American Steel & Wire Co., Worcester, Mass., is buying automobile scrap for which dealers are paying $7.75 a ton, delivered.

Apparently the General Fire Extinguisher Co., Providence, R. I., has not covered on its recent inquiry for pig iron, and other melters who have been talking about buying have not done so. A buying movement is expected, however, around the middle of this month, with Windsor, Vt., Bridgeport, Conn., and other machine tool manufacturing centers leading in the movement.

Mills on 60 Per Cent Basis in Southern Ohio

CINCINNATI, Jan. 8.—Extending into the new year, a better than 60 per cent demand for sheets has continued for five weeks in this area. The sustained character of recent business is particularly encouraging because it continued through the inventory period without noticeable decline. Sheet users are ordering for urgent needs, although occasional anticipatory contracting has built up small backlogs at district mills. The bulk of current demand is from automobile manufacturers. Mill operations are being conservatively advanced above 60 per cent of capacity output, but sudden and abnormal stimulation is being avoided.

A tendency of melters of pig iron to contract for more than immediate requirements is a feature of the new year's market. While here and there moderate improvement in the melt is discernible, the general level of foundry operations does not warrant contracting, so that it is the opinion of the trade that returning confidence, coupled with usual new year optimism, is largely responsible for the improvement in forward commitments. Several small interests in Kentucky, Indiana and southern Ohio ordered 150 tons of Southern iron each, while Northern interests failed to report better than 100-ton orders. Fourth quarter shipments were 25 per cent heavier than those of the preceding quarter.

Improved consumption of coke by stove foundries in fourth quarter is giving way to heavier demand from automobile foundries. New contracting on the 30-day basis is slightly better than in December.

Scrap dealers' optimism is sustaining present market prices. Yard supplies are held close, but there is only casual interest in the market on the part of mills. The Norfolk & Western has offered a special list of about 5000 tons.

Steel Specifications Improve at St. Louis

ST. LOUIS, Jan. 8.—The year's first week developed some specifications against contracts for finished iron and steel, but little new business. Mills expect a heavy first quarter, based on public works contracted for or contemplated.

New pig iron business is light. December shipments equaled those of November, although there is usually a decline in December on account of inventory-taking.

The scrap market is steady, with prices unchanged. There was no buying during the week, although dealers expect some this week.

Two Steckel Cold Mills Are Ordered

THE West Leechburg Steel Co., Pittsburgh, has placed an order with the Cold Metal Process Co., Youngstown, for a 20-in. Steckel reversing cold-rolling mill, to be installed at its Leechburg, Pa., plant. It will be the sixth mill of this type to be installed at Leechburg.

The cold metal company has also received an order from Dominion Foundries & Steel, Ltd., Hamilton, Ont., for a 20-in. wide single stand cold-rolling mill, the first of its type to be installed there.

The Bethlehem Steel Co. has established mill depot facilities at Houston, Tex., effective Jan. 1, 1935. Arrangements are being made to utilize the former buildings and property of the Midwest Piping & Supply Co., Inc., 600 Bringhurst Street, near Clinton Drive. This step has been undertaken because of the increasing demand for steel materials in the South, particularly for sheet and wire products.

Philadelphia Rate Advances One Point to 28 Per Cent

This District Not Experiencing Upturn Prevalent in the West—Liberal Navy Releases Would Be Boon—Auto-Body Builders Active

PHILADELPHIA, Jan. 8.—For some months steel operators have been looking to the new year for relief from unprofitable operations. The mills further west have been rewarded, mostly on the strength of a seasonal surge in the public's demand for new-model automobiles, but this territory is receiving little benefit from this impetus. Admittedly good auto buying helps the Philadelphia area in an indirect way, but so long as railroads, shipbuilders, and the oil companies restrict purchases to a negligible level, there is little hope that operations here will reach a money-making 40 to 45 per cent level.

Operations have increased, being at 28 per cent for this week. However several mills have put on extra furnaces for the purpose of rebuilding ingot stocks rather than as a reflection of an improved flow of orders. Lukens Steel Co., Alan Wood Steel Co., and Bethlehem Steel Co. are all melting in heavier volume, but the other mills are operating at a rate commensurate with average December activity.

If the Navy should reverse its usual policy and release a good proportion of the tonnage now on operators' books, activity would probably rise temporarily to a 40 per cent level. However such action is unlikely, as several small mills still have Government business on their books which was let almost a year ago.

Warehouses here are operating on skeleton stocks. At present the demands are so small that only nominal replacement orders are expected from this direction during the next few months. Users of bolts and nuts have almost ceased buying after the heavy ordering which occurred late in December to escape a price advance. Fresh demand for these products is not expected until the second quarter.

Pig Iron

This commodity continues to drag along, with little or no improvement over December from a sales standpoint. Foundries apparently have no intention of changing their policy of restricting forward purchases. Consequently sales are spotty and consist mostly of quick deliveries for immediate melting. Heavier buying during the quarter depends on increased demand for miscellaneous castings and a decided improvement in pipe foundry activity. Around 500 tons of Russian iron has been sold in this district. A boatload is on its way from that country and should dock here during the next month.

Sheets

Blue-annealed sheets are only slightly active, but full-finished material is in fair demand as a result of improved operations in local auto-body stamping plants. About 3000 tons of auto sheets are being purchased each week, either in this district or further west, and buyers expect that the excellent reaction to the New York automobile show will be reflected in even heavier demand later in the quarter. Demands for sheets from other industries are almost negligible, although several encouraging Government inquiries are now up for bidding. The Bureau of Supplies and Accounts, Navy Department, is accepting tenders until Jan. 25 on 1256 tons of sheets to be used for replenishing stocks at various Navy yards. The Marine Corps at the Philadelphia Navy Yard closed bids on Jan. 9 on 125 tons of sheets to be used for lockers.

Bars, Plates, and Shapes

Sellers are somewhat discouraged by lack of demand from railroads, shipbuilders, and oil companies. As a result bars and plates are inactive. American Drydock Corpn. is low bidder on 600 tons for a ferryboat to be built for the Erie Railroad. The market for shapes is in a better condition, inasmuch as several sizable projects have been awarded and other large tonnages have appeared for bidding. The American Bridge Co. will furnish about 1000 tons for three Pennsylvania highway bridges, and will also supply 1400 tons for a parcel post building at Richmond, Va. Tenders go in this week on 265 tons for a Sullivan County, Pa., bridge, and the Philadelphia Navy Yard is accepting bids until Jan. 30 on 1500 tons for four buildings. Also a bridge at Norfolk, Va., requiring 1300 tons, should be placed before the end of the month. The Navy Department, Washington, is taking bids on Jan. 18 for 715 tons of miscellaneous shapes for stock, and on Jan. 25 about 380 tons of Bethlehem or Carnegie sections will be purchased. This material will be used in cruisers being built at Brooklyn, N. Y., and at Philadelphia.

Imports

The following iron and steel imports were received here last week: 4988 tons of chrome ore from Cuba, 3500 tons from Portuguese Africa and 1100 tons of the same product, together with 25 tons of manganese ore, from British India, and 6 tons of steel bars from Belgium.

In the previous week imports here included 524 tons of pig iron from British India; 110 tons of steel bars, 48 tons of steel tubes, 12 tons of steel forgings and 1 ton of steel rods from Sweden; and 21 tons of steel bars from Belgium.

During the week of Dec. 16 imports here were entirely from Sweden: 52 tons of sponge iron, 31 tons of steel tubes, 23 tons of steel bars and 8 tons of steel forgings.

Scrap

This market has lost some of its momentum. However, the smaller dealers are still holding tightly to their supplies; consequently the flow of steel to brokers at present price levels is not so large as during late fourth quarter. But this lessened flow is not embarrassing brokers, as the requirements for export are diminishing, and domestic mills have not as yet entered orders of any size. Most old foreign commitments are fairly well cleaned up, but indications are that European and Japanese melters will meet the higher prices here to a limited extent in the near future. Their new policy, however, is to buy as much steel as possible in districts where the domestic price competition is not so keen as here. At present, steel accumulations are being built up at Port Richmond for a Japanese boat expected in Jan. 11. The No. 1 steel price for domestic use has been raised to $11 on the strength of a small special tonnage sold last week. Indications are that the next good tonnage sold in eastern Pennsylvania will bring a price close to $12. A good sale of No. 2 steel has been made at around $9.75; consequently that grade is now quoted at $9.50 to $10. No. 1 cast is also higher, having been sold at close to $11.50. At Baltimore, Bethlehem is still in the market for No. 1 and No. 2 steel for Sparrows Point, Md. However the quantity of material available there at $10.50 and $9.50 is not nearly so plentiful as a month ago.

Prices of Finished Steel and Iron Products

BARS, PLATES, SHAPES

Iron and Steel Bars

	Soft Steel	*Base per Lb.*
F.o.b. Pittsburgh		1.80c.
F.o.b. Chicago		1.85c.
F.o.b. Gary		1.85c.
F.o.b. Duluth		1.95c.
Del'd Detroit		1.95c.
F.o.b. Cleveland		1.85c.
F.o.b. Buffalo		1.90c.
Del'd Philadelphia		2.09c.
Del'd New York		2.13c.
F.o.b. Birmingham		1.95c.
F.o.b. cars dock Gulf ports		2.20c.
F.o.b. cars dock Pacific ports		2.35c.

Rail Steel

(For merchant trade)

F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Moline, Ill.	1.75c.
F.o.b. Cleveland	1.75c.
F.o.b. Buffajo	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. cars dock Gulf ports	2.10c.
F.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing

(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	2.05c.
F.o.b. Chicago	2.10c.
F.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
F.o.b. Cleveland	2.10c.
F.o.b. Youngstown	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. Birmingham	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing

(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.30c.

Iron

F.o.b. Chicago	1.80c.
F.o.b. Terre Haute, Ind.	1.75c.
F.o.b. Louisville, Ky.	2.10c.
F.o.b. Danville, Pa.	1.80c.
F.o.b. Berwick, Pa.	1.70c.

Cold Finished Bars and Shafting*

	Base per Lb.
F.o.b. Pittsburgh	2.10c.
F.o.b. Chicago	2.15c.
F.o.b. Gary	2.15c.
F.o.b. Cleveland	2.15c.
F.o.b. Buffalo	2.20c.
Del'd Detroit	2.30c.
Del'd eastern Michigan	2.35c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts

Angle Line Posts

	Base per Net Ton
F.o.b. Pittsburgh	$50.00
F.o.b. Chicago	50.00
F.o.b. Duluth	51.00
F.o.b. Cleveland	50.00
F.o.b. Birmingham	53.00
F.o.b. Houston, Orange, Beaumont, Galveston	59.00
F.o.b. Mobile	58.00
F.o.b. New Orleans, Lake Charles, Corpus Christi	59.00
F.o.b. cars dock Pacific ports	63.00

Plates

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Coatesville	1.90c.
F.o.b. Sparrows Point	1.90c.
Del'd Philadelphia	1.985c.
Del'd New York	2.08c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. P'gh	3.00c.

Floor Plates

F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Buffalo	1.90c.
F.o.b. Bethlehem	1.90c.
Del'd Philadelphia	2.005c.
Del'd New York	2.0525c
F.o.b. Birmingham (standard)	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb
No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Phila.	2.14c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. dock cars Pacific ports	2.40c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.60c.
No. 24, del'd Phila.	2.69c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. dock cars Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, del'd Detroit	2.70c.
No. 10 gage, del'd Phila.	2.79c.
No. 10 gage, f.o.b. Birmingham	2.65c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.10c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Phila.	3.24c.
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.50c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Phila.	3.39c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. dock cars Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.40c.
F.o.b. cars dock Pacific ports	4.10c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock, Pacific Coast ports	3.35c.

Tin Plate *Per Base Box*

Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Rolled Strips

	Base per Lb.
F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
Del'd Chicago	2.88c.
F.o.b. Worcester	2.80c.

Fender Stock

No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

Hot-Rolled Rail Steel Strips

	Base per Lb.
F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	*Per Lb.*
Bright wire	2.30c.
Spring wire	2.90c.

Chicago prices on products sold to the manufacturing trade are $1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are $2 a ton above, Birmingham $3 above, and Pacific Coast prices $9 a ton above Pittsburgh or Cleveland.

To Jobbing Trade

Qualified jobbers are entitled to a reduction of 20c. a 100 lb. from the base price on carload shipments to stock, and of 10c. a 100 lb. on less-carload shipments to stock.

	Base per Keg
Standard wire nails	$2.60
Smooth coated nails	2.60
Galvanized nails:	
15 gage and coarser	4.60
16 gage and finer	5.10

	Base per 100 Lb.
Annealed fence wire	$2.45
Galvanized fence wire	2.80
Polished staples	3.30
Galvanized staples	3.55
Barbed wire, galvanized	3.00
Woven wire fence, base column	63.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi, Tex., New Orleans, Lake Charles, La., and Mobile, Ala., are $6 a ton over Pittsburgh, while Pacific Coast prices are $8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are $11 a ton above Pittsburgh.

On staples and barbed wire, prices of $6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

Wire Hoops, Twisted or Welded

	Off List
F.o.b. Pittsburgh	35 and 2½ off
F.o.b. Chicago	35 off

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel Inches	Black	Galv.
⅛	51½	29½
¼ to ⅜	53½	35
½	58½	47
¾	62	52
1 to 3	64	55

Wrought Iron Inches	Black	Galv.
⅛	+91½	+138
¼ & ⅜	+1½	+21½
½	31½	15
¾	36½	20½
1 & 1¼	39½	25½
1½	43½	28
2	41½	26

Lap Weld

2	60	51	2	37	22½
2½ to 3	63	54	2½ to 3½	38	25
3½ to 6	65	56	4 to 8	40	28½
7 and 8	64	54	9 to 12	38	24½
9 and 10	63½	53½			
11 and 12	62½	52½			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	51	38	¼ & ⅜	+2½	+34½
½	56½	47½	½	32½	17½
¾	61	52	¾	37½	22½
1 to 3	63	55	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	58	50	2	40	26
2½ to 3	62	54	2½ to 4	45½	33
3½ to 6	65½	57½	4½ to 6	45	33½
7 and 8	64½	54½	7 & 8	46	33
9 and 10	63½	53½	9 to 12	41½	30
11 and 12	62½	52½			

On standard steel pipe an extra 5% off is allowed on sales to consumers while two 5's off apply on sales to jobbers. On less-than-carload shipments prices are determined by adding 20 and 25% and the carload freight rate to the base card. On structural steel pipe the base card is reduced 2 points and two 5's off are allowed to consumers and three 5's off to jobbers.

Note—Chicago district mills have a base two points less than the above discounts Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

		Cold Drawn	Hot Rolled
1 in. o.d.	13 B.W.G.	$ 8.60	$7.82
1¼ in. o.d.	13 B.W.G.	10.19	9.26
1½ in o.d.	13 B.W.G.	11.26	10.23
1¾ in. o.d.	13 B.W.G.	12.81	11.64
2 in. o.d.	13 B.W.G.	14.35	13.04
2¼ in. o.d.	13 B.W.G.	16.00	14.54
2½ in. o.d.	12 B.W.G.	19.29	17.54
2¾ in. o.d.	12 B.W.G.	20.45	18.59
3 in. o.d.	12 B.W.G.	21.45	19.50
3¼ in. o.d.	11 B.W.G.	25.22	22.93
3½ in. o.d.	11 B.W.G.	27.09	24.62
4 in. o.d.	10 B.W.G.	33.60	30.54
4½ in. o.d.	10 B.W.G.	41.08	37.35
5 in. o.d.	9 B.W.G.	51.56	46.87
6 in. o.d.	7 B.W.G.	79.15	71.96

Extras for less-carload quantities:

25,000 lb. or ft. to 39,999 lb. or ft.	5 %
10,000 lb. or ft. to 24,999 lb. or ft.	12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	25 %
Under 2,000 lb. or ft.	40 %

Hot-Finished Lapweld Steel Pressure Tubes

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

1½ in. o.d.	13 B.W.G.	$ 9.72
1¾ in. o.d.	13 B.W.G.	11.06
2 in. o.d.	13 B.W.G.	12.38
2¼ in. o.d.	13 B.W.G.	13.79
2½ in. o.d.	12 B.W.G.	16.58
2¾ in. o.d.	12 B.W.G.	17.54
3 in. o.d.	12 B.W.G.	18.35
3¼ in. o.d.	11 B.W.G.	21.56
3½ in. o.d.	11 B.W.G.	23.15
4 in. o.d.	10 B.W.G.	28.66
4½ in. o.d.	10 B.W.G.	35.22
5 in. o.d.	9 B.W.G.	44.25
6 in. o.d.	7 B.W.G.	68.14

Quantity Extras:

40,000 lb. or ft.	base
25,000 lb. or ft. to 39,999 lb. or ft.	plus 5 %
10,000 lb. or ft. to 24,999 lb. or ft.	plus 12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	plus 25 %
Under 2,000 lb. or ft.	plus 40 %

CHARCOAL IRON BOILER TUBES

Base Discounts, f.o.b. Pittsburgh

In. O. D.	
1½ and 1¾	44
2 —2¼	13 and 10
2½—2¾	16 and 10
3	17 and 10
3¼—3½	18 and 10
4	20 and 10
4½, 5, 6	21 and 10

Extras for quantity: For 1½ to 1¾, up 8 points under 10,000 lb., up 4 points 10,000 lb. to carload. For 2 in. to 5½ in., up 2 points without supplementary 10 per cent, under 10,000 lb.; supplementary 5 per cent instead of supplementary 10 per cent for 10,000 lb. to carload.

In sizes 2 in. to 4½ in. O.D. inclusive, all tubes more than four gages heavier than standard are priced per lb. as follows: Carload and over, 9c.; extras for quantity—under 10,000 lb. 1c. per lb., 10,000 lb. to carload ½c. per lb.

CAST IRON WATER PIPE

	Per Net Ton
*6-in. and larger, del'd Chicago	$47.00
*4-in., del'd Chicago	50.00
6-in. and larger, del'd New York	45.00
4-in. del'd New York	48.00
6-in. and larger, Birmingham	39.00
4-in. Birmingham	42.00

Class "A" and gas pipe. $3 extra

*Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $46 and 4-in. pipe $49 a ton, delivered Chicago.

RAILROAD MATERIALS

Rails and Track Supplies

f.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

f.o.b. Code Basing Points

Light rails (from billets) per gross ton	$35.00
Light rails (from rail steel) per gross ton	$4.00

	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.40
Spikes, boat and barge	2.40
Tie plates, steel	1.90
Tie plates, Pacific Coast ports	2.00
Track bolts, to steam railroads	3.55
Track bolts, no jobbers, all sizes (per 100 count)	70 per cent off list

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va., Jersey City, N. J.

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70, 10 and 10
Carriage bolts	70, 10 and 10
Lag bolts	70, 10 and 10
Flow bolts, Nos. 1, 2, 3 and 7 heads	70, 10 and 10
Std-pressed nuts, blank or tapped, square	70, 10 and 10
Std-pressed nuts, blank or tapped, hexagons	70, 10 and 10
C.p.c. and t. square or hex. nuts, blank or tapped	70, 10 and 10
Semi-finished hexagon nuts, U.S.S. all sizes	70, 10 and 10
Semi-finished hexagon nuts, S.A.E. ¼ in. to 7/16 in. diameter	75, 10 and 10
½ in. to 1 in. diameter	75, 10 and 10
larger than 1 in. diameter	75, 10 and 10
Stove bolts 11 packages, Pittsburgh	75
Stove bolts in packages, Chicago	75
Stove bolts in packages, Cleveland	75
Stove bolts in bulk, P'gh	83
Stove bolts in bulk, Chicago	83
Stove bolts in bulk, Cleveland	83
Tire bolts	60 and 10

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.ab. Pittsburgh or Cleveland	$2.90
F.ab. Chicago	3.00
F.ab. Birmingham	3.05

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.ab. Pittsburgh	70 and 5
F.ab. Cleveland	70 and 5
F.ab. Chicago and Birm'g'm	70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws, 1 in. dia. and smaller	80, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75
Milled headless set screws, cut thread ⅜ in. and smaller	75
Unset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Unset set screws, cut and oval point	75 and 10 to 80
Milled studs	65 to 65 and 10

Alloy and Stainless Steel

Alloy Steel Ingots

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Uncropped ..... $40 per gross ton

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, $49 a gross ton.

Alloy Steel Bars

Price del'd Detroit is $52.

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base	2.45c.
Delivered price at Detroit is	2.60c.

A.I.S.E. Series Numbers	Alloy	Differential per 100 lb.
2300	(1½% Nickel)	$0.25
2100	(2½% Nickel)	0.55
2200	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
5100	Nickel Chromium	0.55
5200	Nickel Chromium	1.35
5300	Nickel Chromium	3.80
5400	Nickel Chromium	3.20
6100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
6100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	base
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.70
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 2.95c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr, 7 to 9% Ni, 0.08 to 0.20% C)

(Base Prices, f.o.b. Pittsburgh)

	Per Lb.
Forging billets	19.55c.
Rerolling slabs	15c.
Bars	23c.
Plates	26c.
Structural shapes	23c.
Sheets	33c.
Hot-rolled strip	20¾c.
Cold-rolled strip	27c.
Drawn wire	23c.

Raw and Semi-Finished Steel

Carbon Steel Rerolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham. Uncropped ..... $29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Birmingham. Uncropped ..... $31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.

	Per Gross Ton
Rerolling	$27.00
Forging quality	32.00

Delivered Detroit

Rerolling	$30.00
Forging	35.00

Billets Only F.o.b. Duluth

Rerolling	$29.00
Forging	34.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or Bessemer	$28.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved	1.70c.
Universal	1.70c.
Sheared	1.70c.

Tube Rounds

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Buffalo	1.90c.
F.o.b. Birmingham	1.95c.

Wire Rods

(Common, base)

	Per Gross Ton
F.o.b. Pittsburgh	$38.00
F.o.b. Cleveland	38.00
F.o.b. Chicago	39.00
F.o.b. Anderson, Ind.	39.00
F.o.b. Youngstown	39.00
F.o.b. Worcester, Mass.	40.00
F.o.b. Birmingham	41.00
F.o.b. San Francisco	47.00
F.o.b. Galveston	44.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$19.50	$20.00	$19.00	$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	.....	.....	19.00	.....
Sparrows Point, Md.	19.50	.....	19.00	.....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	17.50	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	.....
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	18.50	18.00	.....
Duluth, Minn.	19.00	19.00	.....	19.50
Birmingham	14.50	14.50	13.50	19.00
Provo, Utah	17.50	.....	17.00	.....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass.	$20.00	$20.50	$19.50	$21.00
Brooklyn				
From East Pa. or Buffalo	21.77	22.27	21.27	22.77
Newark or Jersey City, N. J.				
From East. Pa. or Buffalo	20.89	21.39	20.39	21.89
Philadelphia				
From Eastern Pa.	20.26	20.76	19.76	21.26
Cincinnati				
From Hamilton, Ohio	19.51	19.51	19.01	20.01
Canton, Ohio				
From Cleveland and Youngstown	19.76	19.76	19.26	20.26
Columbus, Ohio				
From Hamilton, Ohio	20.50	20.50	.....	.....
Mansfield, Ohio				
From Cleveland and Toledo	20.26	20.26	.....	.....
Indianapolis				
From Hamilton, Ohio	20.77	20.77	.....	.....
South Bend, Ind.				
From Chicago	20.55	20.55	.....	.....
Milwaukee				
From Chicago	19.50	19.50	.....	.....
St. Paul				
From Duluth	20.94	.....	.....	.....
Davenport, Iowa				
From Chicago	20.26	20.26	.....	.....
Kansas City				
From Granite City	21.04	21.04	.....	.....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. $23.50

GRAY FORGE PIG IRON

Valley furnace	$18.00
Pittsburgh district furnace	18.00

CHARCOAL PIG IRON

Lake Superior furnace	$21.00
Delivered Chicago	24.04
Delivered Buffalo	24.28

CANADA

Pig Iron

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

	Per Gross Ton
Domestic, 80% (carload)	$85.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$26.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (ton lots)	85.00
75% (carloads)	126.00
75% (ton lots)	136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid)	31.00
14% to 16% (less carloads)	38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6%	$22.75	12%	$29.25
7%	23.75	13%	30.75
8%	24.75	14%	32.25
9%	25.75	15%	33.75
10%	26.75	16%	35.25
11%	27.75	17%	36.75

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10%	$27.75	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W, del., carloads	$1.35 to $1.45
Ferrotungsten, less carloads	1.45 to 1.55
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr. per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained V	$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace carload and contract per net ton	$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$38.00
Ton lots or less per ton	45.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	90.00
2% carbon grade	95.00
1% carbon grade	105.00
Spot prices	$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$13.00 to $13.50
No. 2 heavy melting steel	12.00 to 12.50
No. 2 railroad wrought	13.00 to 13.50
Scrap rails	13.00 to 13.50
Rails 3 ft. and under	14.50 to 15.00
Compressed sheet steel	12.75 to 13.25
Hand bundled sheet steel	11.50 to 12.00
Hvy. steel axle turnings	10.00 to 10.50
Machine shop turnings	8.50 to 9.00
Short shov. turnings	8.50 to 9.00
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
Cast iron carwheels	12.50 to 13.00
Heavy breakable cast	11.50 to 12.00
No. 1 cast	12.50 to 13.00
Railr. knuckles and couplers	14.00 to 14.50
Rail. coil and leaf springs	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
Low phos. billet crops	15.00 to 15.50
Low phos. sheet bar crops	15.00 to 15.50
Low phos. plate scrap	13.50 to 14.00
Low phos. punchings	14.00 to 14.50
Steel car axles	14.00 to 14.50

CHICAGO

Delivered Chicago district consumers:
Per Gross Ton

Heavy melting steel	$12.50 to $13.00
Automobile hvy. melt. steel	11.50 to 12.00
Shoveling steel	12.00 to 12.50
Hydraulic comp. sheets	11.50 to 12.00
Drop forge flashings	10.50 to 11.00
No. 1 busheling	11.00 to 11.50
Rolled carwheels	13.00 to 13.50
Railroad tires	13.00 to 13.50
Railroad leaf springs	13.00 to 13.50
Axle turnings	11.00 to 11.50
Steel couplers and knuckles	13.00 to 13.50
Coil springs	12.50 to 13.00
Axle turnings (elec. fur.)	11.00 to 11.50
Low phos. punchings	13.00 to 13.50
Low phos. plates, 12 in. and under	14.00 to 14.50
Cast iron borings	6.50 to 7.00
Short shoveling turnings	6.50 to 7.00
Machine shop turnings	5.50 to 6.00
Rerolling rails	13.00 to 13.50
Steel rails, less than 3 ft.	14.00 to 14.50
Steel rails, less than 2 ft.	14.50 to 15.00
Angle bars, steel	13.00 to 13.50
Cast iron carwheels	12.00 to 12.50
Railroad malleable	14.00 to 14.50
Agricultural malleable	10.00 to 10.50

Per Net Ton

Iron car axles	$16.50 to $17.00
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	11.00 to 11.50
No. 2 busheling	5.50 to 6.00
Locomotive tires, smooth	10.00 to 10.50
Pipe and flues	5.50 to 6.00
No. 1 machinery cast	10.75 to 11.25
Clean automobile cast	11.00 to 11.50
No. 1 railroad cast	10.00 to 10.50
No. 1 agricultural cast	9.50 to 10.00
Stove plate	6.50 to 7.00
Grate bars	6.50 to 7.00
Brake shoes	7.25 to 7.75

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.00
No. 2 heavy melting steel	$9.50 to 10.00
No. 1 railroad wrought	11.00 to 11.50
Bundled sheets	9.00
Hydraulic compressed, new	10.00 to 10.50
Hydraulic compressed, old	6.50 to 7.00
Machine shop turnings	5.50 to 6.00
Heavy axle turnings	8.50 to 9.00
Cast borings	5.00 to 5.50
Heavy breakable cast	10.00 to 10.25
Stove plate (steel works)	8.50 to 9.00
No. 1 low phos. heavy	15.00 to 15.50
Couplers and knuckles	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
No. 1 blast furnace	5.00 to 5.50
Snec. iron and steel pipe	8.00
Shafting	17.00
Steel axles	16.50 to 17.00
No. 1 forge fire	9.00
Cast iron car wheels	11.50 to 12.00
No. 1 cast	11.00 to 11.50
Cast borings (chem.)	12.00 to 14.00
Steel rails for rolling	12.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$8.25 to $8.75
Scrap rails for melting	9.50 to 10.00
Loose sheet clippings	5.00 to 5.50
Bundled sheets	7.00 to 7.50
Cast iron borings	5.50 to 6.00
Machine shop turnings	5.50 to 6.00
No. 1 busheling	7.00 to 7.50
No. 2 busheling	3.75 to 4.25
Rails for rolling	10.00 to 10.50
No. 1 locomotive tires	9.50 to 10.00
Short rails	12.50 to 13.00
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	10.25 to 10.75
No. 1 railroad cast	9.50 to 10.00
Burnt cast	7.00 to 7.50
Stove plate	7.00 to 7.50
Agricultural malleable	9.00 to 9.50
Railroad malleable	9.25 to 9.75

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.00 to $11.50
No. 2 heavy melting steel	10.50 to 11.00
Compressed sheet steel	10.50 to 11.00
Light bundled sheet stampings	8.50 to 9.00
Drop forge flashings	9.50 to 10.00
Machine shop turnings	7.00 to 7.50
Short shoveling turnings	7.50 to 8.00
No. 1 busheling	9.50 to 10.00
Steel axle turnings	9.50 to 10.00
Low phos. billet crops	14.50 to 15.00
Cast iron borings	7.50 to 8.00
Mixed borings and short turnings	7.50 to 8.00
No. 2 busheling	7.50 to 8.00
No. 1 cast	12.50 to 13.00
Railroad grate bars	7.00 to 7.50
Stove plate	8.00 to 8.50
Rails under 3 ft.	15.00 to 15.50
Rails for rolling	15.50 to 18.00
Railroad malleable	12.00 to 12.50
Cast iron carwheels	12.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$11.50 to $12.00
No. 2 heavy melting scrap	10.50 to 11.00
Scrap rails	11.00 to 11.50
New hydraul. comp. sheets	10.50 to 11.00
Old hydraul. comp. sheets	8.75 to 9.25
Drop forge flashings	10.50 to 11.00
No. 1 busheling	10.50 to 11.00
Hvy. steel axle turnings	7.00 to 7.50
Machine shop turnings	5.00 to 5.50
Knuckles and couplers	13.00 to 13.50
Coil and leaf springs	13.00 to 13.50
Rolled steel wheels	13.00 to 13.50
Low phos. billet crops	13.25 to 13.75
Short shov. steel turnings	5.50 to 6.00
Short mixed borings and turnings	5.50 to 6.00
Cast iron borings	5.50 to 6.00
No. 2 busheling	6.50 to 7.00
Steel car axles	11.50 to 12.00
Iron Axles	11.50 to 12.00
No. 1 machinery cast	12.00 to 12.50
No. 1 cupola cast	10.00 to 10.50
Stove plate	9.25 to 9.75
Steel rails, 3 ft. and under	13.00 to 13.50
Cast iron carwheels	11.00 to 11.50
Industrial malleable	12.50 to 13.00
Railroad malleable	12.50 to 13.00
Chemical borings	7.00 to 7.50

BOSTON

Dealers' buying prices per gross ton:

*No. 1 heavy melting steel	$8.75 to $9.00
No. 1 heavy melting steel	7.00 to 7.25
Scrap T rails	7.50 to 7.75
*No. 2 steel	7.75 to 8.00
No. 2 steel	6.00 to 6.25
Breakable cast	6.00 to 6.50
Machine shop turnings	2.75 to 3.00
Bundled skeleton, long	5.50 to 5.75
Forge flashings	5.50 to 5.75
Shafting	11.50 to 12.00
Steel car axles	11.50 to 12.00
Cast iron borings, chemical	6.50 to 7.00
Stove plate	4.00 to 4.25

Per gross ton delivered consumers' yards:

Textile cast	$9.00 to $9.50
No. 1 machinery cast	9.00 to 9.50
Stove plate	6.00 to 6.50
Railroad malleable	11.00 to 11.50

* Delivered local army base.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	*$7.25 †8.75
No. 2 heavy melting steel	*5.75 to †7.25
Heavy breakable cast	6.75 to 7.25
No. 1 machinery cast	7.50 to 8.00
No. 2 cast	6.50 to 7.00
Stove plate	5.75 to 6.25
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
No. 1 yard wrought, long	6.50 to 7.00
Snec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rolling	9.00 to 9.50
Short shoveling turnings	2.50 to 3.00
Machine shop turnings	2.50 to 3.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.00 to 4.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	$10.50
No. 1 hvy. cast (cupola size)	9.50
No. 2 cast	8.00

*For direct car loading only.
†Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$9.00
Scrap steel rails	10.00
Short shoveling turnings	6.50
Stove plates	6.50
Steel axles	10.00 to 10.50
Iron axles	10.00 to 10.50
No. 1 railroad wrought	6.50
Rails for rolling	11.00 to 12.00
No. 1 cast	9.50 to 10.00
Tramcar wheels	9.00 to 9.50
Cast iron borings, chem.	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$9.00 to $9.50
No. 1 heavy melting	8.00 to 8.50
No. 2 heavy melting	7.00 to 7.50
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	9.50 to 10.00
Railroad springs	10.50 to 11.00
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	9.00 to 9.50
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	2.50 to 3.00
Rails for rolling	11.00 to 11.50
Machine shop turnings	2.50 to 3.00
Heavy turnings	5.50 to 6.00
Steel car axles	13.50 to 14.00
Iron car axles	13.50 to 14.00
No. 1 railroad wrought	7.00 to 7.50
Steel rails less than 3 ft.	11.75 to 12.25
Steel angle bars	9.50 to 10.00
Cast iron carwheels	8.25 to 9.25
No. 1 machinery cast	8.50 to 9.00
Railroad malleable	10.00 to 10.50
No. 1 railroad cast	8.50 to 9.00
Stove plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$9.00 to $9.50
Borings and short turnings	5.50 to 6.00
Long turnings	$5.00 to $5.50
No. 1 machinery cast	10.50 to 11.00
Automotive cast	10.75 to 11.25
Hydraul. comp. sheets	10.00 to 10.50
Stove plate	6.50 to 7.00
New factory busheling	7.75 to 8.25
Old No. 2 busheling	5.00 to 5.50
Sheet clippings	6.00 to 6.50
Flashings	8.50 to 9.00
Low phos. plate scrap	9.75 to 10.25

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports
Per Gross Ton

Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore
Per Unit

Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algeria	9.50c.
Iron, low phos., Swedish, average 68½% iron	9.50c.
Iron, basic or foundry, Swedish, aver. 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron	9c.
Manganese, Caucasian, washed 52%	26c.
Manganese, African, Indian, 44-48%	21c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48½	20c.

Per Net Ton Unit

Tungsten, Chinese, wolframite, duty paid, delivered*	$17.50 to $18.50
Tungsten, domestic scheelite, delivered†	17.00

Per Gross Ton

Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	$17.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic Seaboard	20.00

*Quotations nominal in absence of sales.
†Nominal; no supplies available.

Fluorspar

Per Net Ton

Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines for all-rail shipment	$15.50 to $16.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	17.50
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	$15.50 to 16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke

Per Net Ton

Furnace, f.o.b. Connellsville Prompt	$3.85
Foundry, f.o.b. Connellsville Prompt	$4.60 to 5.10
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	$9.23
Foundry, Birmingham	6.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	8.00

Coal

Per Net Ton

Mine run steam coal, f.o.b. W. Pa. mines	$1.80 to $2.05
Mine run coking coal f.o.b. W. Pa.	2.05 to 2.25
Gas coal, ¾-in. f.o.b. Pa. mines	2.25 to 2.50
Mine run gas coal f.o.b. Pa. mines	2.05 to 2.45
Steam slack, f.o.b. W. Pa. mines	1.55 to 1.80
Gas slack, f.o.b. W. Pa. mines	1.90 to 2.10

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. del'd Chicago

No. 3 industrial fuel oil	3.88c.
No. 5 industrial fuel oil	3.38c.

Per Gal. f.o.b. Cleveland

No. 3 distillate	5.50c.
No. 4 industrial	5.25c.
No. 5 industrial	4.00c.

REFRACTORIES

Fire Clay Brick

Per 1000 f.o.b. Works

	High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	42.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Chrome Brick

Per Net Ton

Standard size	$45.00

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania	$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

Per Net Ton

Standard size, burned, f.o.b. Baltimore and Chester, Pa.	$45.00
Unburned, f.o.b. Baltimore	55.00
Imported grain magnesite, f.o.b. Baltimore and Chester, Pa.	45.00
Domestic grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	32.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock:	
Rounds and hexagons	*3.45c.
Squares and flats	*3.45c.
Hoops and bands under ¼ in.	3.20c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.30c.
Galv. sheets (No. 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.69
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count,	65 per cent off list.
Machine bolts, 100 count,	65 per cent off list.
Carriage bolts, 100 count,	65 per cent off list.
Nuts, all styles, 100 count,	65 per cent off list.
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb.	*2.70
Wire, galv. soft, base per 100 lb.	*2.925
Common wire nails, per keg	*2.834
Cement coated nails, per keg	*2.834

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

*Delivered in Pittsburgh switching district.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.20c.
Soft steel bars	2.95c.
Cold-fin. steel bars:	
Rounds and hexagons	3.50c.
Flats and squares	3.50c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.
	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts, sq. tap. or blank	60 and 5
Hot-pressed nuts, hex. tap or blank	60 and 5
Hex. head cap screws	80
Cup point set screws	70 and 10
Flat head bright wood screws	37½ and 10
Spring cotters	50
Stove bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57½
Wrought washers	$4.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.85
Com. wire nails, base per keg	3.05
Cement c't'd nails, base per keg	3.05

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.

NEW YORK

	Base per Lb
Plates, ¼ in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, small shapes	3.22c.
Iron bars	3.22c.
Iron bars, swed. charcoal	6.75c. to 7.25c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-rolled; strip, soft and quarter hard	3.32c.
Hoops	3.52c.
Bands	3.52c.
Hot-rolled sheets (No. 10)	3.27c.
Hot-rolled ann'l'd sheets (No. 24*)	3.85c.
Galvanized sheets (No. 24*)	4.50c.
Long terne sheets (No. 24)	5.20c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.25c.
Wire, galv. (No. 10)	3.85c.
Tire steel, 1 x ⅛ in. and larger	3.65c.
Open hearth spring steel	4.00c. to 10.00c.
Common wire nails, base, per keg	$3.21
	Per Cent
Machine bolts, cut thread:	Off List
All diameters	70
Carriage bolts, cut thread:	
All diameters	70
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.44c.
Bars, soft steel or iron	3.19c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	4.09c.
Galv. sheets (No. 24)	4.79c.
Hot-rolled sheets (No. 10)	3.29c.
Black corrug. sheets (No. 24)	4.09c.
*Galv. corrug. sheets	4.79c.
Structural rivets	3.99c.
Boiler rivets	4.09c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws, fittings up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts:	
1000 lb. or over	70 and 10
200 to 999 lb.	67½ and 10
100 to 199 lb.	65 and 10
Less than 100 lb.	60 and 10

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.95c.
*Structural shapes	2.95c.
*Soft steel bars, small shapes, iron bars (except bands)	2.90c.
‡Reinforc. steel bars, sq. twisted and deformed	2.955c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.40c.
*Steel bands, No. 12 and 3/16 in., incl.	3.15c.
Spring steel	5.00c.
†Hot-rolled anneal. sheets (No. 24)	3.55c.
†Galvanized sheets (No. 24)	4.25c.
*Hot-rolled annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, ¼ in.	4.95c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For less than 2000 lb.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.31c.
Soft steel bars	2.95c.
Reinforc. steel bars	*2.10c.
Cold-finished steel bars	3.40c.
Flat-rolled steel under ¼ in.	3.36c.
Cold-finished strip	†3.00c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 24)	4.81c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.56c.
Black ann'l'd wire, per 100 lb.	$2.65
No. 9 galv. wire, per 100 lb.	3.00
Com. wire nails, base per keg	2.40

*Plus mill, size and quantity extras.

†Outside delivery 10c. less.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.15c.
New billet reinforc. bars	3.25c.
Rail steel reinforc. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.45c.
Cold-finished bars	3.70c.
Hot-rolled annealed sheets (No. 24)	4.00c.
Galv. sheets (No. 24)	4.70c.
Hot-rolled sheets (No. 10)	3.20c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over)	$2.91
Com. wire nails, base per keg (1 to 24 kegs)	3.50
25 to 50 kegs	3.30
Larger quantities	3.10
Cement c't'd nails, base 100-lb. keg	3.50
Chain, 1-in., per 100 lb.	8.35
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$19.03
4-in.	44.96
Lap-welded steel boiler tubes, 2-in.	18.10
4-in.	42.32

BUFFALO

	Base per Lb.
Plates	3.27c.
Struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.60c.
Cold-fin. flats and sq.	3.55c.
Round and hex.	3.55c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.05c.
Heavy hot-rolled sheets, 3/16 in., 24 to 48 in. wide	3.62c.
Galv. sheets (No. 24)	4.70c.
Bands	3.42c.
Hoops	3.42c.
Hot-rolled unannealed sheets	3.17c.
Com. wire nails, base per keg	$3.25
Black wire, base per 100 lb.	3.55c.

BOSTON

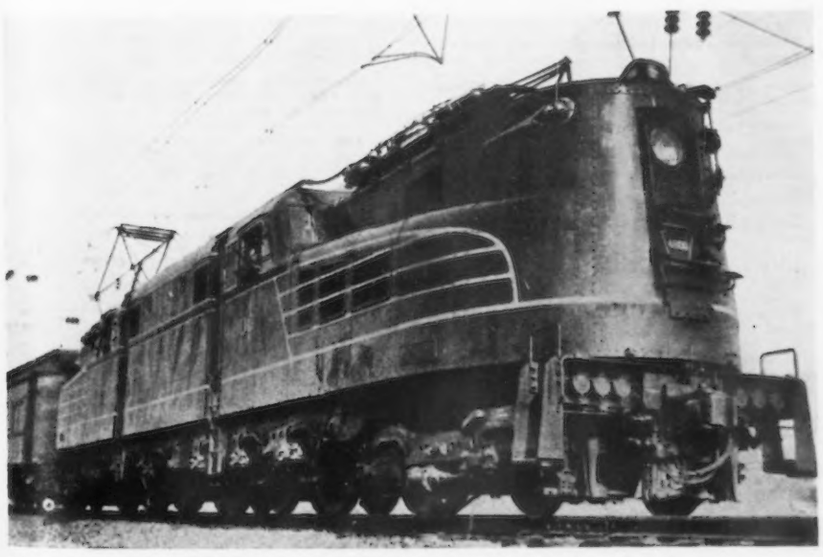
	Per Lb. Base
Beams, channels, angles, tees, zees	3.52c.
H beams and shapes	3.52c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	3.53c.
Floor plates, diamond pattern	5.33c.
Bar and bar shapes (mild steel)	3.30c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.60c. to 4.60c.
Half rounds, half ovals, ovals and bevels	4.55c.
Tire steel	4.55c.
Cold-finished rounds and hexagons	5.25c.
Cold-rolled strip steel	3.245c.
Cold-finished squares and flats	4.30c.
Blue annealed sheets, No. 10 gal.	3.60c.
One pass cold-rolled sheets No. 24 ga.	4.15c.
Galvanized steel sheets, No. 24 ga.	4.85c.
Lead coated sheets, No. 24 ga.	5.80c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.55c.	3.70c.	3.55c.
Shapes, standard	3.55c.	3.70c.	3.55c.
Soft steel bars	3.60c.	3.70c.	3.60c.
Reinforcing bars	3.50c.	3.50c.	3.50c.
Hot-rolled annealed sheets (No. 24)	4.40c.	4.45c.	4.40c.
Hot-rolled sheets (No. 10)	3.75c.	3.80c.	3.75c.
Galv. sheets (No. 24)	5.00c.	5.05c.	5.00c.
Cold finished steel:			
Rounds	5.95c.	5.95c.	4.75c.
Squares and hexagons	7.20c.	7.20c.	6.00c.
Flats	7.70c.	7.70c.	7.00c.
Common wire nails —base per keg	$3.40	$3.25	$3.30

All items subject to differentials for quantity.



THIS blunt-nosed, strange looking engine is the Pennsylvania Railroad's new streamlined electric locomotive shown in Philadelphia, Nov. 20. Fifty-seven of them are to be built for passenger and freight service on the company's lines between New York and Washington.

Fabricated Structural Steel

Lettings in Good Volume—Gain in New Projects

AWARDS of 28,200 tons are swelled by 8250 tons for a parcel post building at Boston. Other sizable bookings are 3050 tons for the Lorain Road bridge, Cleveland, and 2400 tons of structural steel and 1400 tons of sheet piling for a dam in the Mississippi River at Winona, Minn. New projects of 25,950 tons compare with 7400 tons the last week in December. The outstanding new job is 8000 tons for an express highway in New York over the tracks of the New York Central Railroad between West Seventy-second and West Seventy-sixth Streets. Plate awards total 6400 tons, with 4800 tons pending. Structural steel contracts in December called for 31,500 tons, compared with 64,025 tons in November and 54,230 tons in October. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Boston, 8250 tons, parcel post building, to American Bridge Co.

Ambridge, Pa., 500 tons, extension to tube mill of Spang, Chalfant & Co., to McClintic-Marshall Corpn.

New York, 200 tons, coal pocket at 138th Street, to Weatherly Steel Co.

Long Island City, N. Y., 130 tons, addition to Gordon Baking Co. building, to National Bridge Works.

Buffalo, 630 tons, police building, to R. S. McManus Steel Construction Co.

Pulaski, N. Y., 122 tons State highway bridge, to McClintic-Marshall Steel Corpn.

Brooklyn, 800 tons, pier No. 38, to Post & McCord, erectors.

Bedford County, Pa., 290 tons, highway bridge, to American Bridge Co.

Montgomery and Tioga Counties, Pa., 700 tons, highway bridges, to American Bridge Co.

Washington, 295 tons, addition to Bowen building, to McClintic-Marshall Corpn.

SOUTH AND SOUTHWEST

Richmond, Va., 1410 tons, parcel post building, to American Bridge Co.

Napier, W. Va., 120 tons, highway bridge No. 1370, to Pan American Bridge Co.

Rockingham, N. C., 210 tons, post office, to Jones & Laughlin Steel Corpn.

Lauderdale County, Miss., 325 tons, bridge, to Virginia Bridge & Iron Co.

Belton, Tex., 210 tons, highway bridge, to Austin Bridge Co.

Abilene, Tex., 310 tons, post office, to McClintic-Marshall Corpn.

Salisaw, Okla., 1345 tons, State highway bridge, to Wisconsin Bridge & Iron Co.

CENTRAL STATES

Cleveland, 3050 tons, Lorain road viaduct, to Fort Pitt Bridge Works Co.

Winona, Minn., 2400 tons structural steel and 1400 tons of sheet piling, dam across Mississippi River, to McClintic-Marshall Corpn.

Detroit, 340 tons, additions for Goebel Brewing Co., to R. C. Mahon Co.

Ottumwa, Iowa, 1750 tons, bridge over Des Moines River, to Pittsburgh-Des Moines Steel Co.

Cherokee County, Iowa, 105 tons, beam spans, to Pittsburgh-Des Moines Steel Co.

Vinton, Iowa, 450 tons, bridge, to Clinton Bridge Co.

St. Clair, Mich., 160 tons, warehouse for Diamond Salt Co., to Whitehead & Kales Co.

Lake County, Ind., 510 tons, bridge, to Mississippi Valley Structural Steel Co.

State of Kansas, 450 tons, highway bridges, to St. Joseph Structural Steel Co.

Wyandotte County, Kan., 405 tons, highway bridge, to Kansas City Structural Steel Co.

Cloud County, Kan., 450 tons, bridge, to Pittsburgh-Des Moines Steel Co.

Pierce County, Neb., 190 tons, State highway job, to Omaha Steel Works.

WESTERN STATES

Boulder Dam, Nev., 350 tons, four bridge spans for intake towers, to McClintic-Marshall Corpn.

Los Angeles, 100 tons, transit shed extension, to Pacific Coast Steel Corpn.

Odair, Wash., 430 tons, upset rods for Grand Coulee Dam, to Isaacson Iron Works.

Almira, Wash., 120 tons, construction bridge at Grand Coulee Dam, to Pacific Car & Foundry Co. and Isaacson Iron Works.

Polk County, Ore., 110 tons, State bridge over Yamhill River, to Poole & McGonigle.

Fresno County, Cal., 117 tons, State bridge over Kings River, to Pacific Coast Steel Corpn.

Monterey County, Cal., 292 tons, State bridge over Burns Creek, to Pacific Coast Steel Corpn.

Honolulu, T. H., 450 tons, Kress store, to Pacific Coast Steel Corpn.

Wailuku, T. H., 100 tons, Kress store, to Pacific Coast Steel Corpn.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Boston, 330 tons, building for United Drug Co.; H. K. Ferguson Co., Cleveland, general contractor.

New York, 8000 tons, express highway from Seventy-second to Seventy-sixth Street over New York Central tracks; bids Jan. 15.

New York, 750 tons, public school No. 146.

New York, 600 tons, Fordham University building.

Philadelphia, 1700 tons, Navy Aircraft building.

State of Pennsylvania, 400 tons, highway bridges.

New Brunswick, N. J., 150 tons, Middlesex County tuberculosis hospital.

West Caln, Pa., 160 tons, State highway bridge.

Lawrenceville, Pa., 550 tons, highway bridge.

Buffalo, 200 tons, Erie County highway bridge.

Delaware County, N. Y., 250 tons, State highway bridge.

Baltimore, 350 tons, Coca Cola Co. warehouse.

Washington, 115 tons, garage for Greyhound Bus Lines.

SOUTH AND SOUTHWEST

Norfolk, Va., 1500 tons, State highway bridge over Lafayette River.

Gassaway, W. Va., 290 tons, State highway job.

Myrtle Beach, S. C., 650 tons, combination highway and railroad bridge for Government.

State of Oklahoma, 425 tons, highway bridge.

Carnegie, Okla., 375 tons, highway bridge.

Turpin, Okla., 375 tons, highway bridge.

Kingfisher, Okla., 125 tons, bridge.

Idavel, Okla., 800 tons, highway bridge.

Phoenix, Ariz., 1081 tons, Maricopa County Municipal Water Conservation District irrigation project; bids Jan. 10.

CENTRAL STATES

Detroit, 1200 tons, gas cleaning system for Ford Motor Co.

Franklin, Ohio, 155 tons, Warren County bridge; bids to be taken by State Highway Department, Jan. 11.

Cincinnati, 200 tons, addition to Clopay Corpn. building.

St. Paul, Minn., 700 tons, armory.

Havana, Ill., 500 tons, two highway bridges.

Shirland, Ill., 180 tons, State highway bridge.

State of Kansas, 2275 tons, bridges.

Mason City, Iowa, 125 tons, store for Montgomery Ward & Co.

WESTERN STATES

Ventura County, Cal., 225 tons of structural steel and 916 tons of sheet piling for State highway construction; bids Jan. 24.

Odair, Wash., 200 tons, warehouse for Bureau of Reclamation.

Mare Island, Cal., 1000 tons, gantry crane for Navy Yard; bids at Washington, Jan. 16.

FABRICATED PLATE

AWARDS

Edge Moor, Del., 145 tons, two water tanks, to Pittsburgh-Des Moines Steel Co.

Edge Moor, 105 tons, oil tank for E. I. du Pont de Nemours & Co., Inc., to Chicago Bridge & Iron Works.

Marcus Hook, Pa., 135 tons, tank roofs, to Pittsburgh-Des Moines Steel Co.

Bayonne, N. J., 130 tons, three tanks, to Hammond Iron Works.

Pittsburgh, 230 tons, buoys, to William B. Scaife & Sons Co.

Fort Peck, Mont., 610 tons, dredge pipe and fittings, to Taylor Pipe & Forge Co.

Fort Peck, Mont., 950 tons, 28 in. welded steel pipe, to McClintic-Marshall Corpn.

Ontario, Ore., 4100 tons, Malheur River siphons, to Consolidated Steel Corp.

NEW PROJECTS

Boulder Dam, Nev., 650 tons, cylinder hoists and bulkhead gates; bids taken.

Los Angeles, 4000 tons, 63,500 ft. of welded steel pipe for Department of Water and Power; bids Jan. 8.

Los Angeles, 135 tons, water stops and plates for Department of Water and Power; Southwest Welding & Mfg. Co. low bidder.

RECOMMENDED practices for gas cutting of structural steel are given in a 16-page, 5 x 8-in. booklet published by the Linde Air Products Co., 30 East Forty-second Street, New York. A feature section of the booklet is that devoted to qualification tests to assure good workmanship from the standpoint both of dimensional accuracy and smoothness of cut. These tests apply only to hand blowpipes or torches and are restricted to plain low-carbon steels.

Month's Copper Sales Total 5000 Tons — Zinc Quotations Advance

December Increase in Spelter Stocks Fails To Affect Market—Lead Market Quiet—More Activity in Tin Reported

NEW YORK, Jan. 8.—Sales of copper thus far in the month are in about the same volume as was the case in the corresponding December period. Although having totaled only 638 tons yesterday, the month's aggregate is close to 5000 tons without including today's transactions. The Blue Eagle price remains unchanged at 9c. a lb., Connecticut Valley, and with no prospect of a change, buyers are entering the market freely for their day-to-day requirements. It is believed, however, that continued improvement in general industrial activity would lead to forward buying in anticipation of an advance in the Blue Eagle quotation. The London price this morning was slightly lower at a range of 7.02½c. to 7.05c. a lb., usual Continental base ports, but the market is fairly active. Projected conferences on production control abroad are still attracting considerable attention.

Tin

The market is considerably stronger here today as a result of higher price on spot metal abroad. Straits tin is quotable at 50.87½c. a lb., compared with 50.65c. yesterday and 50.75c. one week ago. The strength at London is attributable to the squeezing of short interests there and this situation had forced the price of spot tin to £230 17s. 6d. on first call this morning. Futures were quotable at £228 10s., while the Singapore market was holding at £230 15s. Tin sales here in the last week have been somewhat more numerous and the rather sharp rise in tin plate operations following the holidays has made future prospects more hopeful. Prices, however, have been rather unsatisfactory and considerable metal has changed hands at prices under the cost of importation.

Lead

This market is quiet but the undertone is strong and present quotations of 3.55c., St. Louis, and 3.70c., New York, would likely be advanced rather quickly if demand reached sizable proportions. The lead industry is operating at about 50 per cent of capacity and increasing activity among paint manufacturers indicates an even higher level in the near future. The January position is probably 90 per cent sold and some buying for February delivery has been reported. However, consumers are not anxious to commit themselves too far in advance and February metal is not likely to be taken actively until next week. The lead ore market remains firm at $35 to $36 a ton.

Zinc

Rather heavy buying late last week finally exhausted the supply of 3.72½c. metal and the market on Saturday gradually worked up to a 3.75c. a lb. level at East St. Louis, with the usual differential prevailing at New York. Quotations were apparently firm at these figures yesterday. Publication this morning of December statistics which showed a 4000-ton increase in stocks last month had little effect on the market as these data had generally been discounted. The accompanying increase in unfilled orders was encouraging. Sellers are restricting their offerings to February shipment in most cases and occasionally are unwilling to quote at all unless metal is readily available. Under the circumstances, considerable inquiry is appearing without resulting in sales. The zinc ore market continues firm, with $25 a ton being quoted for the flotation grade, and $26 for coarse material. Production amounted to about 3000 tons last week, compared with shipments of 5200 tons and sales of 4050 tons.

WASHINGTON, Jan. 8.—The Bureau of Supplies and Accounts will open bids Jan. 25 on 1256 tons of sheets for stock purposes at the various Navy yards. On the same date bids will also be opened on 381 tons of special shapes, similar or equal to Bethlehem or Carnegie sections, for the cruisers Brooklyn and Philadelphia at the Brooklyn and Philadelphia yards respectively, and for destroyers being built at several yards.

The Week's Prices. Cents Per Pound for Early Delivery

	Jan. 2	Jan. 3	Jan. 4	Jan. 5	Jan. 7	Jan. 8
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, N. Y.	9.12½	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, Spot, New York	50.80	50.60	50.75		50.65	50.87½
Zinc, East St. Louis	3.72½	3.72½	3.72½	3.72½	3.75	3.75
Zinc, New York	4.07½	4.07½	4.07½	4.07½	4.10	4.10
Lead, St. Louis	3.55	3.55	3.55	3.55	3.55	3.55
Lead, New York	3.70	3.70	3.70	3.70	3.70	3.70

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, virgin 99 per cent plus, 19c. to 22c. a lb., delivered.
Aluminum, remelt No. 12 (alloy), carload lots delivered, 14c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 13.87½c. a lb., New York.
Brass ingot, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	52.50c. to 53.50c.
Tin, bar	54.50c. to 55.50c.
Copper, Lake	10.25c. to 11.00c.
Copper, electrolytic	10.00c. to 10.50c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.25c.
*Seamless brass tubes	16.00c.
*Seamless copper tubes	16.25c.
*Brass rods	12.75c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.50c. to 5.50c.
Lead, bar	5.50c. to 6.50c.
Lead, sheets	7.25c.
Antimony, Asiatic	15.50c. to 16.50c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	31.00c. to 32.00c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	53.75c.
Tin, bar	55.37c.
Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig	4.70c. to 4.95c.
Lead, bar	7.75c.
Antimony, Asiatic	15.75c.
Babbitt metal, medium grade	18.50c.
Babbitt metal, high grade	58.75c.
Solder, ½ and ½	32.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.50c.	6.25c.
Copper, hvy. and wire	5.37½c.	5.87½c.
Copper, light and bottoms	4.37½c.	4.87½c.
Brass, heavy	2.87½c.	3.50c.
Brass, light	2.12½c.	2.87½c.
Hvy. machine composition	4.37½c.	4.87½c.
No. 1 yel. brass turnings	3.75c.	4.25c.
No. 1 red brass or compos. turnings	4.00c.	4.50c.
Lead, heavy	2.62½c.	3.00c.
Zinc	1.87½c.	2.25c.
Cast aluminum	9.62½c.	10.75c.
Sheet aluminum	11.00c.	12.50c.

Publish New Edition of Machinery's Handbook

THE Industrial Press, 148 Lafayette Street, New York, has announced a new edition—the ninth—of its well-known Machinery's Handbook, edited by Erik Oberg and Franklin D. Jones.

The handbook contains 1592 pages, 4½ x 7 in. and is divided into 126 main subjects. There are 172 additions or revisions, ranging from complete new sections to small but important changes. Major revisions include new strength of materials data; load capacities of anti-friction bearings; recent developments in plain bearing design; new tables and data relating to different classes of gearing including spiral bevel and hypoid; revised S.A.E. standards; additional screw thread data; a new section on roller chain transmission; revised speed and feed data including actual practice on cemented carbide tools; new standards for taps, gages and milling cutters; electric motor characteristics; die casting compositions; and others. A special thumb index is provided to facilitate opening the book to any one of the 14 main divisions, sections most frequently consulted. The price of the new handbook is $6.

Cast Iron Pipe

Scio, N. Y., plans pipe line along Scio-Belmont Road for main water supply; also new pumping station. Fund of $48,000 has been arranged through Federal aid.

Santaquin, Utah, plans water pipe line system. Fund of $30,000 has been secured through Federal aid for this and other waterworks equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until Jan. 21 for cast iron soil pipe fittings and malleable iron pipe fittings (Schedule 3022).

Austin, Tex., plans water pipe line extensions in different parts of city. Cost about $160,000. Guiton Morgan is city manager.

Redwood City, Cal., plans 10-in. main water supply line, connecting with Bay Crossing pipe line of San Francisco water system. Cost about $25,500. C. L. Dimmitt is city engineer.

North East, Pa., plans main pipe line for water supply from Black Brook district. Fund of $125,000 has been arranged for this and other waterworks construction.

Adams, Wis., closes bids Jan. 23 for water pipe; also for elevated steel tank and tower, electric-operated and gas engine-operated pumping machinery and other equipment. A. E. McMahon Engineering Co., Menasha, Wis., is consulting engineer.

Ely, Minn., plans extensions in water pipe lines and has authorized surveys and estimates of cost.

Mansfield, Ark., plans call for bids this month for water pipe line and other waterworks installation. Bids recently received have been rejected. Fund of $56,000 is available.

Bellevue, Ohio, plans water pipe lines, filtration plant and other waterworks installation. George B. Gascoigne & Co., Leader Building, Cleveland, are consulting engineers.

Stratford, Wis., will soon take bids for about 4000 ft. of 6-in.; also for deep well turbine pumping unit and accessories. W. G. Kirchoffer, 22 North Carroll Street, Madison, Wis., is consulting engineer.

Welling, Utah, has awarded 222 tons of 3-in. to Pacific States Cast Iron Pipe Co.

Fox Point, Wis., (Milwaukee P. O.) plans early purchase of 13,000 ft. of 16-in. for water trunk line, connecting with Milwaukee system. C. S. Whitney, 724 East Mason Street, is village engineer.

Brielle, N. J., plans water pipe lines. Fund of $40,000 has been arranged for this and other waterworks. G. Rowland Moore, Manasquan, N. J., is consulting engineer.

Spanish Fork, Utah, has awarded 1000 tons to Pacific States Cast Iron Pipe Co. and to United States Pipe & Foundry Co.

Centerfield, Utah, has awarded 247 tons to Pacific States Cast Iron Pipe Co.

San Diego, Cal., has placed 260 tons with United States Pipe & Foundry Co.

NIRB Will Review Employment Provisions

WASHINGTON, Jan. 8.—Announcement was made today by the National Industrial Recovery Board that hearings will be held in Washington Jan. 30 on the subject of employment provisions in codes. This will be the second of a series of hearings to collect evidence on the operations of major code provisions. The first will convene in Washington tomorrow, and will deal with the subject of price control.

Mesabi Increases Ore Predominance

IRON ore shipped from the Mesabi range in 1934 was 67.07 per cent of the total amount moved, as compared with 62.3 per cent in 1933 and 54 per cent in 1932, according to the annual report of the Lake Superior Iron Ore Association, covering water shipments for the year. The relative position of the various ranges in shipments did not change as compared with the previous year.

Non-Bessemer ore shipped gained slightly in percentage as compared with the previous year. This grade comprised 70.74 per cent of the total of 22,027,055 tons shipped as compared with 68.8 per cent the previous year and with 67.2 per cent in 1931. Bessemer ore shipped fell off, the percentage of that grade having been 23.28 per cent of this total as compared with 26.4 per cent the previous year. Shipment of silicious ore increased to 521,251 tons from 332,842 tons the previous year, although the total amount of ore moved last year was only slightly more than in 1933.

TOTAL 1934 MOVEMENT OF ORE BY GRADES (TONS)

Bessemer	5,228,497
Non-Bessemer	15,582,211
Manganiferous	695,096
Silicious	521,251
Total	22,027,055

MOVEMENT BY RANGES

Mesabi	14,774,667
Marquette	2,396,339
Gogebic	2,263,896
Menominee	1,317,445
Vermilion	777,230
Cuyuna	497,478
Total	22,027,055

A meeting of unsecured creditors of the Follansbee Brothers Co. was held last week at Pittsburgh, for the purpose of forming a permanent creditors' committee to represent unsecured creditors in any proposed reorganization that may be submitted to the Federal District Court. Louis Berkman of Steubenville, Ohio, was elected chairman of the permanent creditors' committee; C. B. Everberg was elected secretary, and L. L. Dalbey of Youngstown, Ohio, was named as a third member.

Macwhyte Co., Kenosha, Wis., manufacturer of wire rope and braided wire rope slings, has appointed Brown-Wales Co., 493 C Street, Boston, as distributer for Macwhyte products.

New Clamp Attachment Convenient for Checking

BROWN & SHARPE MFG. CO., Providence, R. I., has added a new clamp attachment to its line of measuring devices. The attachment is specified as No. 734A and is for use with the company's dial test indicators No. 730 and 733. The maximum capacity is 2¾-in. diam. Attachment is to arbor, spindle or similar machine part and dial gage can be used as a convenient means of checking the settings of fixtures, vises, etc. A swiveling brass shoe prevents the marring of finished surfaces. The attachment is pictured on page —.

Reinforcing Steel

Awards 4750 Tons—New Projects 6900 Tons

Hartford, Conn., 130 tons, filtration plant, to a New York bidder.

Dedham, Mass., 125 tons, highway and bridge, to Truscon Steel Co.

Cleveland, 295 tons, Lorain Road bridge, to Fort Pitt Bridge Works Co.

Springfield, Ill., 375 tons, water plant, to an unnamed bidder.

Lockport, Ill., 110 tons, addition to power house, to an unnamed bidder.

Winona, Minn., 300 tons, dam across Mississippi River, to McClintic-Marshall Corpn.

Los Angeles, 1785 tons, billet and rail reinforcing steel for Metropolitan Water District, to Los Angeles Iron & Steel Co. and Blue Diamond Corpn.

Oakland, Cal., 930 tons, County court house, to Judson Mfg. Co.

San Francisco, 400 tons, Caswell Coffee Co. building, to Truscon Steel Co.

Glendale, Cal., 128 tons, debris dam, to an unnamed bidder.

Beverly Hills, Cal., 150 tons, medical building, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

Togus, Me., 500 tons, Soldiers' Home.

Somerville, Mass., 150 tons, school.

Dedham, Mass., 125 tons, highway and bridge.

Holyoke, Mass., 100 tons, highway and bridge.

New York, 625 tons, piers for Tri-Borough bridge; to be readvertised.

New York Central Railroad, 150 tons, West Side improvements in New York.

Augusta, Ga., 100 tons, Savannah River lock and dam; Arundel Corpn., Baltimore, general contractor.

Zanesville, Ohio, district office of Engineer Corpn., United States Army, 1015 tons of deformed reinforcing steel for following dams: Tappan, 40 tons; Charles Mill, 75 tons; Will's Creek, 400 tons; Clemdening, 100 tons; Beach City, 400 tons; bids taken Jan. 7.

Denver, 3500 tons, enlarging and lining Moffatt Tunnel; bids Jan. 16.

Pinal County, Ariz., 100 tons, State railroad underpass; bids Jan. 15.

Phoenix, Ariz., 485 tons, Maricopa County Municipal Water Conservation District irrigation project; bids Jan. 10.

Oakland, Cal., 680 tons, reinforced concrete wharf; bids in about 30 days.

State of California, 183 tons, highway work in nine counties; bids Jan. 24.

San Diego, Cal., 190 tons, repair of Hodges dam; bids soon.

Venice, Cal., 533 tons, Venice high school; general contract awarded.

Seattle, 100 tons, bridge in Mount Rainier Reserve for Bureau of Public Roads; bids Feb. 2.

Pipe Lines

Utilities Commission, Duluth, Minn., Ernest A. Bodin, commissioner, has engaged Charles Foster, Sellwood Building, consulting engineer, to make surveys and recommendations for steel pipe line for central steam-heating distribution in East End district, including distributing power station. Cost close to $3,000,000.

Bureau of Reclamation, Denver, asks bids until Jan. 17, for 36-in. welded plate steel penstock and waste-way pipe, and 22-in. welded plate steel discharge pipe for Wellsville Canal pumping plant, Hyrum Project, Hyrum, Utah (Specification 646-D).

Detroit plans about 3600 ft. of steel pipe for high-pressure water service for fire department in West Jefferson Avenue and Twelfth Street. Cost about $170,000. Board of Fire Commissioners, Wayne and Larned Streets is in charge.

Plummer Drilling Co., Victoria, Tex., care of J. G. Johnston, Victoria, engineer, plans 4-in. welded steel crude oil pipe line from Colletto Creek oil field to Aloe, Tex., where oil-loading plant will be located.

Lone Star Gas Co., Dallas, Tex., is considering new 20-in. welded steel pipe line from natural gas fields at Long Lake, Tex., to Dallas and vicinity, about 100 miles. Company has closed contracts with Texas Seaboard Oil Co. and Tidewater Oil Co., operating in Long Lake field for gas supply. Cost over $1,700,000. Frank L. Chase is vice-president.

Quartermaster Depot, 1819 West Pershing Road, Chicago, asks bids until Jan. 19 for 20,400 ft. of 2½-in. steel pipe (Circular 149).

St. George, Utah, plans welded steel pipe line for trunk main water service, from source of supply to new 200,000-gal. water storage basin; also replacement of present wood-stave pipe with cast iron mains for distribution. Fund of $132,000 has been secured through Federal aid.

John W. Moore Co., Lubbock, Tex., plans 8-in. welded steel pipe line from gas fields in Brown County, near Brownwood, to Kerrville, Tex., about 145 miles, for natural gas service at last noted place and neighboring communities. Cost close to $1,200,000. W. D. Horan, Amarillo, Tex., is company engineer; Hawley, Freese & Nichols, Capps Building, Fort Worth, Tex., are consulting engineers.

Paramount Gasoline Corpn., Houston, Tex., plans steel pipe in connection with new gasoline extraction plant near Pledger Dome natural gas field, Brazoria County. Permission has been secured to use total of 80,000,000 cu. ft. daily from that source. It is proposed to begin work soon.

United States Engineer, Kansas City, Mo., has awarded 425 tons of steel pipe to McClintic-Marshall Corpn. for Fort Peck, Mont.

Shawnee, Okla., has placed 500 tons of 20-in. steel pipe with Taylor Pipe & Forge Co., Chicago.

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FOR EVERY PURPOSE
Plain and Ornamental Perforations in a great variety of sizes and styles, made in any metal.
Excellence of product and low prices.
The Harrington & King PERFORATING CO.
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CHICAGO, ILL.

Railroad Equipment

Chicago Great Western has ordered one 0-4-4-0 oil-electric switching locomotive from Westinghouse Electric & Mfg. Co.

Winton Engine Corpn. is constructing a two-car unit with a Diesel-electric locomotive. Each car unit can be operated separately.

Lehigh Valley has placed 250 70-ton gondola cars with Bethlehem Steel Co.

Atchison, Topeka & Santa Fe has ordered one 600-hp. Diesel switching locomotive from American Locomotive Co.

Chicago Great Western has ordered one 800-hp. Diesel electric switching locomotive from Westinghouse Electric & Mfg. Co.

RAILS

Interborough Rapid Transit Co., New York, is in the market for 2000 tons of rails.

Delaware, Lackawanna & Western has ordered 4000 tons of rails and 3000 tons of fastenings for immediate delivery.

Chicago, Burlington & Quincy expects to purchase 15,000 tons of 112 and 90-lb. rails, and about 4000 tons of accessories.

Seaboard Airline has ordered 586,000 tie plates from Tennessee Coal, Iron & Railroad Co., Republic Steel Corpn., and Wheeling Steel Co.

Pullman-Standard Car Mfg. Co., is the new name of the consolidated domestic manufacturing subsidiaries of Pullman, Inc. The units embraced in the consolidation include Pullman Car & Manufacturing Corpn., Dickson Car Wheel Co., New Orleans Car Wheel Co., Standard Steel Car Corpn. of Delaware, Standard Steel Car Corpn. of Pennsylvania, Pullman-Bradley Car Corpn. and Richmond Car Corpn. All plants of the companies are to be operated as at present.

Iron and Steel Exports and Imports Higher

Exports of Iron and Steel from the United States
(In Gross Tons)

	November		Ten Months Ended November	
	1934	1933	1934	1933
Pig iron	230	42	3,120	2,302
Ferromanganese	59	6	144	39
Scrap	216,566	86,577	1,639,193	672,417
Pig iron, ferroalloys and scrap	*216,855*	*86,625*	*1,642,457*	*674,758*
Ingots, blooms, billets, sheet bars	3,627	112	17,907	3,009
Skelp	11,058	4,724	74,073	22,728
Wire rods	3,710	2,062	23,274	13,667
Semi-finished steel	*18,395*	*6,898*	*115,254*	*39,404*
Steel bars	3,502	1,944	37,426	19,156
Alloy steel bars	253	134	2,663	1,354
Iron bars	144	130	970	571
Plates, iron and steel	3,310	1,967	35,038	11,789
Sheets, galvanized steel	6,778	3,177	61,489	45,663
Sheets, galvanized iron	21	93	1,215	1,000
Sheets, black steel	10,377	4,859	81,526	32,918
Sheets, black iron	263	512	4,106	2,539
Hoops, bands, strip steel	2,027	1,974	25,756	18,381
Tin plate, terne plate	11,831	15,647	166,700	76,267
Structural shapes, plain material	2,462	998	30,594	13,041
Structural material, fabricated	1,735	1,520	19,140	13,914
Tanks, steel	925	221	6,863	2,391
Steel rails	2,947	7,472	61,057	32,379
Rail fastenings, switches, spikes, etc.	929	3,437	15,532	9,405
Boiler tubes	885	299	7,542	3,575
Casing and oil line pipe	1,711	4,550	55,870	34,886
Pipe, black and galvanized, welded steel	2,997	3,356	40,772	30,285
Pipe, black and galvanized, welded iron	164	147	2,101	1,331
Plain wire	2,034	2,870	33,699	18,573
Barbed wire and woven wire fencing	2,570	3,173	34,586	26,403
Wire cloth and screening	64	36	899	624
Wire rope	212	372	2,533	1,980
Wire nails	1,044	984	12,184	9,136
Other nails and tacks	324	294	4,555	3,593
Other wire and manufactures	337	253	4,362	2,532
Bolts, nuts, rivets and washers, except track	434	357	4,608	3,245
Other finished steel	122	125	1,636	1,828
Rolled and finished steel	*60,402*	*60,901*	*755,422*	*418,159*
Cast iron pipe and fittings	1,366	1,284	15,558	11,139
Malleable iron screwed fittings	207	219	2,751	2,263
Carwheels and axles	1,195	234	6,170	3,487
Iron castings	400	969	6,462	3,638
Steel castings	181	224	2,175	885
Forgings	262	246	3,860	2,825
Castings and forgings	*3,611*	*3,176*	*36,976*	*24,237*
Total	299,263	157,600	2,550,109	1,156,558

Imports of Iron and Steel Products Into the United States
(In Gross Tons)

	November		Eleven Months Ended November	
	1934	1933	1934	1933
Pig iron	6,055	4,079	111,828	143,065
Sponge iron	....	....	796	619
Ferromanganese and spiegeleisen[1]	10,826	9,791	36,427	54,996
Ferrochrome[2]	....	....	74	24
Ferrosilicon[3]	45	310	719	813
Other ferroalloys[4]	....	....	46	102
Scrap	7,606	2,935	39,932	56,678
Pig iron, ferroalloys and scrap	*24,532*	*17,115*	*189,822*	*256,297*
Steel ingots, blooms, etc.	408	69	1,825	938
Wire rods	880	778	9,693	12,198
Semi-finished steel	*1,288*	*847*	*11,518*	*13,136*
Concrete reinforcement bars	101	479	1,239	2,517
Hollow steel bars	43	118	765	871
Merchant steel bars	1,696	2,026	17,411	18,762
Iron slabs	....	....	1	1
Iron bars	15	93	714	439
Boiler and other plate	11	43	246	234
Sheets, skelp and saw plate	219	682	4,143	8,577
Tin plate	2	....	147	232
Structural shapes	3,328	2,164	22,251	26,806
Sheet piling	....	....	1,109	166
Rails and rail fastenings	305	981	3,025	6,301
Cast-iron pipe and fittings	25	186	65	910
Welded pipe	97	150	1,666	3,889
Other pipe	235	278	2,798	2,008
Barbed wire	294	389	8,528	6,916
Round iron and steel wire	209	458	2,366	2,954
Telegraph and telephone wire	1	....	22	26
Flat wire and strip steel	216	150	1,625	1,192
Wire rope and strand	60	163	1,455	1,471
Other wire	64	125	748	1,503
Hoops and bands	1,840	1,682	16,825	20,056
Nails, tacks and staples	488	651	6,583	6,145
Bolts, nuts and rivets	29	26	242	249
Horse and mule shoes	59	20	379	344
Rolled and finished steel	*9,312*	*10,678*	*94,288*	*111,659*
Cast iron pipe and fittings	25	186	65	910
Castings and forgings	115	153	1,360	1,260
Total	35,272	28,979	297,053	383,262

[1] Manganese content. [2] Chrome content. [3] Silicon content. [4] Alloy content.

BOTH exports and imports of iron and steel products rose sharply in November, as compared with the preceding month. As mentioned in THE IRON AGE last week, exports totaled 299,263 tons, compared with 220,209 tons in the preceding month and with 157,600 tons in November, 1933. Imports rose to 35,272 tons, an increase of 15,070 tons over October, and compared with 28,979 tons in November, 1933.

November imports of ferromanganese and spiegeleisen totaled 10,826 tons, compared with 9791 tons in November, 1933. Pig iron imports were 6055 tons, compared with 4079 tons in the corresponding month of the preceding year. Among rolled and finished products, structural shapes led in importations, 3328 tons having been brought in. Of this total Belgium furnished 3063 tons and France 227 tons. Belgium also furnished 1229 tons of the 1696 tons of merchant bars imported.

Comparative details on exports were published in THE IRON AGE of Jan. 3, page 210. Other data are included in the accompanying tables.

United States Imports of Pig Iron by Countries of Origin
(In Gross Tons)

	November		Eleven Months Ended November	
	1934	1933	1934	1933
United Kingdom	60	....	600	5,395
British India	2,201	3,447	32,705	61,100
Germany	....	....	....	234
Netherlands	2,539	151	61,939	58,165
Canada	740	360	8,700	11,492
France	....	....	100	....
Belgium	....	....	50	....
Norway	139	3	2,185	806
Sweden	376	....	991	3,205
All others	....	118	4,558	2,702
Total	6,055	4,079	111,828	143,099

Sources of American Imports of Iron and Manganese Ores
(In Gross Tons)

	November, 1934	
	Iron Ore	Manganese Concentrates, 35 Per Cent or Over
Canada	....	....
Cuba	22,000	2,596
Chile	43,400	....
Spain	100	....
Norway	....	....
Sweden	7,383	....
French Africa	....	....
Russia	5,440	4,570
India	....	....
Brazil	....	4,057
West Africa	....	2,345
Other countries	751	101
Total	79,074	13,669

The Age of Dura Craftsmanship

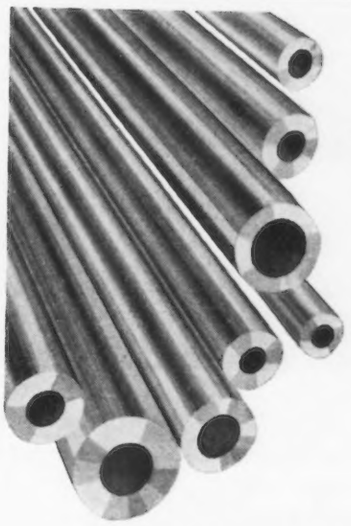
(CONCLUDED FROM PAGE 15)

close riveted link mesh. This was found just where its owner dropped it on the floor of the Guard Tower—"petrified" during its 1800-year wait for us. How kindly were the dry desert sands that drifted in and how fortunate the scanty annual rainfall of 3 in. This specimen is unique. Another rusty iron cuirass was found still faithfully protecting the skeleton of its brave hero, but its condition is comparatively uninteresting.

These small iron dart and arrow heads with sharp barbs and tangs are beautifully designed, efficiently shaped and skillfully hammered, while these horseshoes are crudely forged with rugged fitness. Evidently labor was valued above material. We find both socketed and tanged heads, both types as classified in tool catalogs, but antedating our earliest citations by eight centuries. These tools were made by practical mechanics.

No wonder we steel workers eagerly await conclusions after collating further information and research, analyzing the metals and comparing additional specimens which we hope will come to America this year. We commend in superlative terms the perception, technique and perseverance of the Yale Archeological Expedition. They are bringing revelation and inspiration to the American steel industry. We solicit further information on this subject, references and citations of collateral records, as well as criticisms of these, our first observations, impromptu and premature.

IN case of war, what is the position of the United States with regard to domestic supplies of important raw materials or ready accessibility to them from other countries? A study of this subject has been made and the results are now available in book form under the title of "The Strategy of Raw Materials," by Brooks Emeny, published by the Macmillan Co., New York. This book is illustrated throughout by a large number of original charts and maps which clearly compare the position of the United States to that of the other industrialized powers. The author considers food supplies, steel alloy metals, miscellaneous minerals, rubber, fibers, hides, and miscellaneous raw materials including the medicinal group. As a conclusion Mr. Emeny recommends specific measures which should be adopted as a means of assuring complete self-sufficiency under all war contingencies.



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SPACERS, BUSHINGS, Etc.

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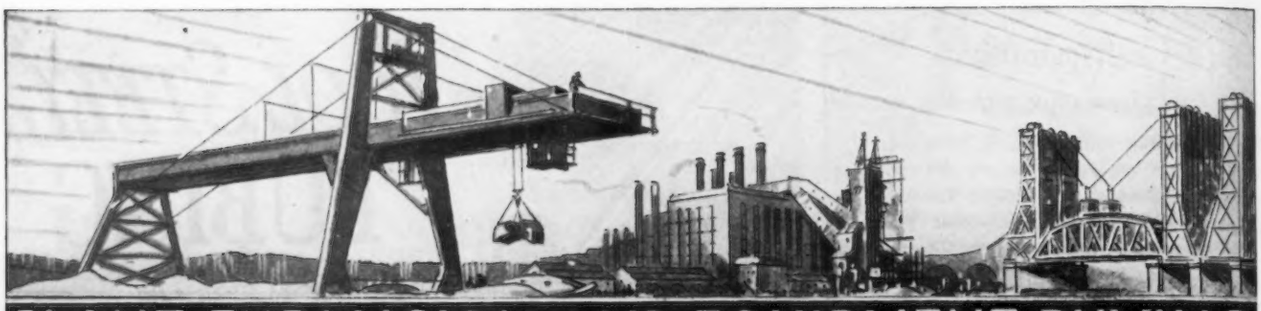
Editor's Note: This is a series of observations which, strangely enough, are exactly what they purport to be. In other words, they come from the daily diary of a real boss; a prominent executive in the metal-working industry who prefers to remain an anonymous author.

The Boss's Diary

I got a great kick the other day. I was calling on a fellow executive, a bright, brilliant, money=making chap but one of those fellows who knows the last word on every subject and who couches his opinions in such an emphatic way that you are wrong every way from the ace before you start if you happen to think differently.

As I sat beside him one of his technical staff came in with some dope relating to one of their jobs. It so happened that this fellow Boss had also been doing some private figuring on this same job and had arrived at certain con=clusions of his own which unfortunately erred seriously from the real technician's findings. It sure was interesting to sit on the side lines and watch the fur fly and more interest=ing to see my cocksure friend have to admit finally that he had "pointed off" wrong in his calculations. Well I've done the same thing so I knew how he felt but I've been at this bossing business longer than my friend has and the difference is that he's sure before he starts and I'm never sure even after I've finished.



PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Industry Awaiting Indications of Year's Trend

DEMAND for machine tools has been quiet in the last week, but inquiry continues to appear in good volume and sizeable orders are expected before the end of the month. Builders are engaged in estimating their probable 1935 volume and, in practically all cases, an improvement over 1934 is expected.

The Ford company has been buying equipment for its foreign subsidiaries and total purchases are believed to have bulked rather large. Another large automobile company is expected to announce a large tooling program within the next 30 days. However, automotive buying this year is difficult to estimate as most companies are committed to policies of strict economy and will not likely buy tools except in cases of necessity.

The head of one large machine tool company has called attention to the fact that a shortage of machine tools is by no means impossible in the case of substantial business recovery. A factor which might encourage this eventuality is the growing export demand.

NORTH ATLANTIC

Public Works Branch, Treasury Department, Washington, plans automobile service, repair shop and garage to accommodate over 100 Federal motor trucks and cars in connection with new postoffice at Grand Concourse and 149th Street, New York, for which bids will be asked soon on general contract. A steam power plant, including boiler and engine departments, will be installed. Fund of $1,575,000 has been authorized for structure.

Ford Instrument Co., Inc., Rawson Street, Long Island City, manufacturer of gun control equipment and other precision instruments, has let general contract to Wehle Engineering Co., 89-31 161st Street, Jamaica, L. I., for new one-story plant, 200 x 300 ft. Cost close to $75,000 with equipment.

A. Slonim & Sons, Inc., New York, has been organized by Abraham and Joseph Slonim, 2128 East Twenty-seventh Street, Brooklyn, to manufacture metal castings and stampings.

Standard Gas & Electric Co., 111 Broadway, New York, has authorized fund of $7,157,400 for extensions and improvements in electric light and power plants in different parts of country, including equipment, additions and improvements in power substations, transmission and distribution lines and other properties. Work will be carried out through 1935. For same period, appropriation of $1,825,000 has been approved for extensions and improvements in gas properties, including station facilities, pipe lines, etc.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 15 for steel metal furniture (Schedule 3916) for Brooklyn, Charleston and Philadelphia navy yards; 40,150 lb. of iron or steel welding electrodes (Schedule 4030) for Brooklyn, Portsmouth and Mare Island yards; 1170 aluminum food containers, covers and carriers (Schedule 4012) for Brooklyn, San Diego and Puget Sound yards; spare parts for springs (Schedule 4031) for Brooklyn, Sewall's Point and Mare Island yards; corrosion-resisting bar steel (Schedule 4052) for Brooklyn, Portsmouth and Mare Island yards; until Jan. 18, 1550 aluminum chairs (Schedule 4034) for Brooklyn, Norfolk, Sewall's Point and Mare Island yards.

B. F. Metcalf & Son, Inc., Chittenango, N. Y., has been organized by B. F. and M. E. Metcalf, Chittenango, to manufacture mechanical equipment, hardware specialties, etc.

Central Guarantee Sheet Metal Works, 546 Eleventh Avenue, New York, has leased building at 234 West Sixty-first Street for new plant.

Signal Supply Officer, Army Base, Brooklyn, asks bids until Jan. 14 for 675,000 ft. of wire (Circular 67), paper insulated cable in lots of 10, 100 to 37,370 ft., and quantity of reels (Circular 66); until Jan. 28, 501 control shafts (Circular 69).

Essex Garage Co., Newark, N. J., recently organized, has leased building at 14-24 Beacon Street, totaling 15,000 sq. ft. floor space for new service, repair and garage building.

Milling Machinery Corpn., Hackensack, N. J., has been organized by H. H. Austin and I. R. Lewis, Jr., City National Bank Building, capital $100,000, to manufacture mining machinery and parts.

Commanding Officer, Picatinny Arsenal, Dover, N. J., asks bids until Jan. 15 for four furnace draft automatic controllers (Circular 99).

Board of Education, Teaneck, N. J., plans manual training department in new three-story and basement high school addition. Cost over $600,000. Financing has been arranged through Federal aid. Hacker & Hacker, 201 Main Street, Fort Lee, N. J., are architects; O. E. Goldsmith, 110 West Fortieth Street, New York., is consulting engineer

International Chain & Mfg. Co., York, Pa., manufacturer of iron chains, etc., has filed plans for one-story addition. Cost about $24,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Jan. 30 for new shop buildings, Navy Yard, Aircraft Factory, Philadelphia (Specification 7716). New units will form part of expansion and improvement program at plant, including shops for production of aircraft engines and parts. Fund of about $2,700,000 will be used for entire project.

NEW ENGLAND

Arnold Print Works, Inc., 87 Marshall Street, North Adams, Mass., plans new steam power plant for service at textile dye and print works. Cost over $150,000 with equipment. Westcott & Mapes, Inc., 139 Orange Street, New Haven, Conn., is consulting engineer.

School Board, Swampscott, Mass., H. S. Baldwin, chairman, building committee, plans manual training department in new high school in Phillips Park. Cost about $350,000. Bond issue is being arranged. Cram & Ferguson, 248 Boylston Street, Boston, are architects.

Maguire-Faucher Co., Inc., Cambridge, Mass., has been organized by William F. Maguire and Peter C. Faucher, Nashua, N. H., to manufacture mechanical equipment and operate a general machine works.

Avite Products, Inc., 68 Alford Street, Cambridge, Mass., manufacturer of industrial chemicals, compounds, etc., with branch plants at Manchester, N. H., and Montreal, Que., has acquired former Prospect mill of American Woolen Co., Lawrence, Mass., and will remodel for new factory. Portion of present plant at Montreal will be removed to Lawrence and additional equipment provided. Cost close to $50,000 with machinery.

OHIO AND INDIANA

Stahl Gear & Machine Co., 1390 East Fortieth Street, Cleveland, manufacturer of cut gears and kindred mechanical equipment, has purchased one-story factory, 145 x 247 ft., at 1399 East Fortieth Street, heretofore held by National Iron & Wire Co., and will remodel and equip for new plant, doubling present capacity.

Youngstown Brewing Co., Youngstown, Ohio, care of Harry Weaver, 276 Fairgreen Avenue, head, has taken over former plant of Youngstown Sanitary Laundry Co., and will remodel for new brewery. Cost over $75,000 with equipment.

Board of Public Works, City Hall, Columbus, Ohio, has arranged Federal financing for $320,000 for extensions and improvements in municipal electric light and power plant, to cost about $1,000,000. Work will begin soon and will include installation of new 10,000-kw. turbo-generator, boiler units and accessories, with coal-handling and other mechanical equipment. L. C. Peterman is superintendent of power plant.

Ultra Modern Storm Sash, Inc., Barberton, Ohio, has been organized by Milo Murgul and Forest R. Etling, 271 Twenty-fifth Street,

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WISSCO CONVEYOR BELTS
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N. W., to manufacture metal sash and kindred products.

Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Jan. 18 for steel aircraft bolts, aircraft castle nuts, steel check nuts, clevis bolts, plain aircraft nuts, engine slotted nuts (Circular 391); until Jan. 21, bushings, clamps, turnbuckle assemblies, clevis nuts, clips, pins, etc. (Circular 401); until Jan. 22, nipples, nuts, tees, elbows, bushings, crosses, plugs, etc. (Circular 403); until Jan. 25, 231 starter switch assemlbies (Circular 407); until Jan. 29, 291 pitot static tube assemblies (Circular 411).

Continental Steel Corpn., Kokomo, Ind., has leased property at Tennessee and Nettleton Streets, Memphis, Tenn., for new factory branch, storage and distributing plant. New unit will be operated under name of Continental Steel Sales Corpn.

Manville Mfg. Corpn., 421 West South Street, Indianapolis, has been organized by W. Lee Rickman and Charles J. Manville, 49 North Mount Street, to manufacture safety and protective devices and equipment.

City Council, Wabash, Ind., plans new municipal electric light and power plant on site near Wabash River. Cost over $100,000 with transmission line. Management & Engineering Corpn., 327 South LaSalle Street, Chicago, is consulting engineer.

WASHINGTON DISTRICT

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until Jan. 28 for automobile parts, including stove bolts, lock washers, cotter pins, screws, valve stems, cable, skid chains, chain links, lubricating system fittings, etc. (Circular 84).

Coca-Cola Co., Atlanta, Ga., manufacturer of beverages, asks bids on general contract until Jan. 15 for one-story addition, 215 x 358 ft., to branch plant at Baltimore, for storage and distribution, to include tram rail system, conveying and elevating equipment, and other equipment. Cost close to $100,000. Robert & Co., Inc., Bona Allen Building, Atlanta, is architect and engineer.

General Purchasing Officer, Panama Canal, Washington, asks bids until Jan. 21 for four manganese steel dredge dipper lips, one mechanical integrator, 600 refuse cans, portable resting set, brass or bronze pipe fittings, malleable iron railing fittings, malleable iron unions, couplings, globe valves, gate valves, 10,000 lb. steel screw spikes, twist drills, stone drills, files, pipe wrenches, bolt clippers and other tools and supplies (Circular 84).

Baltimore Pure Rye Distilling Co., Sollers Point, Baltimore, has let general contract to Engineering & Contracting Co., 504½ St. Paul Street, for new six-story storage and distributing building, 90 x 150 ft. Cost over $85,000 with mechanical-handling and other equipment. C. H. Osborne, 222 West Franklin Street, is consulting engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 15 for 17 aluminum or corrosion-resisting steel steam-jacketed kettles (Schedule 4020) for Sewall's Point and Mare Island navy yards; six lubricating oil purifiers and six Diesel oil purifiers and spare parts (Schedule 4023) for Portsmouth and Mare Island navy yards; turbine-driven air compressors and spare parts (Schedule 4029); until Jan. 22, motor-driven pumps and spare parts (Schedule 4035), turbine and motor-driven centrifugal pumps and spare parts (Schedule 3980) for Eastern and Western yards; until Jan. 18, 16,000 lb. boiler plate steel and 2450 lb. marine boiler steel for Newport, R. I., Navy Yard, and 3000 lb. marine boiler steel for Portsmouth, N. H., Navy Yard (Schedule 4062), pumps and spare parts (Schedule 3928) for different yards.

BUFFALO DISTRICT

Penn Yan Bodies, Inc., Penn Yan, N. Y., manufacturer of commercial automobile and bus bodies, plans rebuilding part of plant recently destroyed by fire. Loss over $75,000 with equipment.

Thermo-Vibrator Co., Inc., Gloversville, N. Y., has been organized by Anthony Sarraino, 34 East Boulevard, and George F. Craven, 411 North Main Street, to manufacture vibrating machinery and parts.

City Council, Auburn, N. Y., plans early special election to approve bonds for $310,000 for new municipal electric light and power plant, electrical distribution and street-lighting system. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

WESTERN PA. DISTRICT

Allegheny County Prison Board, City-County Building, Pittsburgh, plans power house, machine shop and other shop units in new County prison, for which site has just been purchased. Cost about $1,500,000 with equipment. Alfred Hopkins & Associates, 415 Lexington Avenue, New York, architects, have made surveys and estimates of cost.

Malone & Nichols Machine Shop, Inc., Burgettstown, Pa., has been organized by G. Nichols and S. S. Malone, Burgettstown, to manufacture pumping machinery and parts, and operate a general machine works.

H. J. Heinz Co., 1062 Progress Street, Pittsburgh, manufacturer of canned food products, has taken out permit for new one-story factory branch and distributing plant at Louisville. Cost over $40,000 with equipment.

Powhatan Coal Co., Welch, W. Va., plans rebuilding part of head house and tipple at local coal-mining properties, recently destroyed by fire. Loss close to $20,000 with machinery.

SOUTH CENTRAL

Brown-Forman Distillery Co., 1908 Howard Street, Louisville, has plans for seven-story and basement addition for storage and distribution. Cost close to $100,000 with equipment. Leslie V. Abbott, 8 Kenwood Village, Louisville, is architect.

City Council, Jackson, Miss., has called special election on Jan. 19 to approve bond issue of $1,500,000 for new municipal electric light and power distribution system, including transmission line to connect with system of Tennessee Valley Authority and power substation facilities.

Board of Education, Nashville, Tenn., George H. Cate, president, plans manual training departments in three new junior high schools, for which bids will be asked soon on general contract. Units include school in East Nashville, to cost about $200,000, George Waller, Nashville, architect; school in Waverly-Belmont district, cost about $190,000, Marr & Holman, Nashville, architects; and three-story high school for Negroes in North Nashville, cost about $175,000, McKissack & McKissack, Nashville, architects.

Director of Purchases, Tennessee Valley Authority, New Sprankle Building, Knoxville, Tenn., asks bids until Feb. 3 for furnishing, fabricating and delivering emergency gates, gate tracks, guides and accessory equipment for turbine inlets; and bulkhead gates, gate guides and auxiliaries for draft tube outlets for Wheeler hydroelectric generating plant.

SOUTH ATLANTIC

City Council, Jacksonville, Fla., has report from Taylor Engineering Co., Jacksonville, consulting engineer, recommending extensions and improvements in municipal electric light and power plant, transmission lines and distribution system to cost $2,454,000, including new 25,000 kw. turbo-generator unit and accessories, 15,000-hp. boiler and auxiliary power station equipment. Proposed expenditures for 1935-36 will approximate $850,000.

City Council, Burlington, N. C., asks bids until Jan. 14 for 100,000-gal. elevated steel tank and tower for municipal waterworks. A. C. Lindberg is consulting engineer.

City Council, Columbia, S. C., is considering new municipal electric light and power plant. Cost over $500,000 with equipment, including distribution lines. L. B. Owens is active in project.

J. W. Holloway, Jr., Meansville, Ga., has plans for new fruit canning plant at Fort Pierce, Fla., consisting of one and two-story units, 60 x 115 ft., and 50 x 80 ft. respectively, latter to be used primarily for storage and distribution. Cost about $30,000 with machinery.

MIDDLE WEST

Commanding Officer, Rock Island Arsenal, Rock Island, Ill., asks bids until Jan. 21 for 21 power trains with four speeds forward and one reverse, herringbone gear transmission with control differential, final drive, fan, clutch, wheel units and spare parts (Circular 182).

Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago, manufacturer of Diesel engines and parts, pumping machinery and other power equipment, plans extensions and modernization in plant at Beloit, Wis. Cost close to $100,000 with equipment.

Novelty Foundry & Iron Works, Inc., 9 Wallace Street, Sterling, Ill., has been organized by I. L. Weaver, Sterling, and associates, to manufacture metal castings, mechanical equipment, etc.

Bureau of Reclamation, Denver, asks bids until Jan. 15 for high-pressure rotary oil pumping unit (Proposal 23338-A). (Postponed from Jan. 3).

Klauer Mfg. Co., Ninth and Washington

(CONTINUED ON PAGE 82)

Red Light... or Green!

"Your metal helps our products bring cars to safe Stops and smooth Starts!"

MR. VINCENT BENDIX,
President and General Manager of the Bendix Products Corporation, discusses the importance of pickling baths

"WOULD you ever dream that your safety depends on a *bath?* But, of course, I mean a *pickling* bath.

"Does that simplify things in your mind... or am I in deeper? Suppose I put it this way: while we don't use Monel Metal to *trim* our automatic clutches or our power brakes for automobiles and aeroplanes, we most emphatically do *depend* on it.

"As you walk through our pickling department, you see plenty of Monel Metal... racks and other equipment. Watch those racks. See the loads they carry. They're strong. See the wear they stand. They're tough. But, more than that, they're non-corrosive. They carry their loads of steel into tankful after tankful of powerful acid... and alkali... and come out unharmed.

"Without that *pickling,* castings would be full of sand, forgings would be full of scale, and every metal part would be full of grease and grime. And then how could we do fine machine work... how could our inspectors spot and reject imperfect pieces?

"When you stop your car, when you start it up... you can't *see* the Monel Metal we use. But you *feel its effects.*

"We too feel its effects. Our pickling baths don't waste their bite on equipment; they use it all on the 'work'. And that's why Monel Metal affects us pleasantly... in terms of reduced costs for pickling room maintenance and repairs!"

* * *

Monel Metal is valued among metal manufacturers for its rust-proofness, for its stout resistance to pickling solutions and for its strength (equal to that of steel) which enables Monel Metal pickling baskets and racks to carry heavy loads. For these same qualities, Monel Metal is also valued in dye-houses, laundries, power plants, canneries and meat packing establishments, in hotels, hospitals, and restaurants.

It is used in all these industries because Monel Metal equipment speeds production, cuts costs. It is used in goods made for sale to the public, because it cleans easily, resists wear and charms the eye by a gleaming beauty that rivals platinum.

No matter how you use metal, or where, there is *some* place where you will find it pays handsomely to adopt Monel Metal. Our engineers, experienced in development work, are at your call to work with you... to help you discover the money in Monel Metal for you. Write,

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York, N.Y.

MONEL METAL

Monel Metal is a registered trademark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

NRA

Monel Metal

(CONTINUED FROM PAGE 78)

Streets, Dubuque, Iowa, manufacturer of sheet metal stampings, iron castings, etc., is considering new power plant for service at works, using Diesel engine-generator unit and accessories. Cost close to $45,000 with equipment.

A. Ferer & Son, 812 Douglas Street, Omaha, Neb., metal goods, have let general contract to A. C. Peterson, 527 Park Avenue, for new one-story galvanizing unit, 33 x 132 ft.

City Council, Shenandoah, Iowa, asks bids until Jan. 21 for extensions in power plant for municipal water system, including new generator unit and accessories, pipe lines, etc. Cost about $55,000. Fred Cain is city clerk.

Quartermaster Depot, 1819 West Pershing Road, Chicago, asks bids until Jan. 28 for 72 cross-cut saws and other supplies (Circular 154).

SOUTHWEST

T. & P. Machine Co., El Dorado, Kan., has plans for new one-story and basement machine shop. Cost about $24,000 with equipment.

Freeman D. Martin, Memorial Hall, Fort Scott, Kan., commissioner of streets and public utilities, asks bids until Jan. 15 for 200,000-gal. elevated steel tank on 75-ft. steel tower, pumping machinery and accessories, filter equipment, pipe lines, etc., for municipal waterworks. Black & Veatch, Mutual Building, Kansas City, Mo., are consulting engineers.

Summerour & Devine, Inc., Kansas City, Mo., recently organized by H. C. Devine, Kansas City, and associates, has leased building at 115 West Seventeenth Street, and will remodel for manufacture of ornamental bronze products, including electric lighting fixtures, etc.

Missouri-Kansas Steel Corpn., Kansas City, Mo., has been organized by E. L. Hudson and Charles W. Lovelace, 435 West Fifty-ninth Street, capital $100,000, to operate a fabricating plant and general iron and steel works.

City Council, Anderson, Mo., is planning new municipal electric light and power plant, including hydroelectric generating station and standby oil engine-generating unit. Cost over $85,000. Financing is being arranged. Albert C. Moore, Joplin, Mo., is consulting engineer.

Laclede Power & Light Co., 1017 Olive Street, St. Louis, has approved plans for addition to electric light and power plant. Cost over $200,000 with equipment. Management & Engineering Corpn., 900 South Boyle Street, is consulting engineer.

Kibele Mfg. Co., San Antonio, Tex., manufacturer of oil-well machinery and parts, has leased space in plant of Mosher Steel Co., Dallas, Tex., for main works. Present plant will be removed to new location and capacity increased.

Burdett Oxygen Co. of Texas, Dallas, Tex., manufacturer of industrial oxygen, etc., has leased building and adjoining land at 3002 Canton Street, for new plant. Glenn Gammon is local manager. Company is affiliated with Compressed Industrial Gases, Inc., 221 North LaSalle Street, Chicago.

MICHIGAN DISTRICT

Goebel Brewing Co., Rivard and Maple Streets, Detroit, has plans for addition to plant, to be equipped primarily as a stock house. Cost over $50,000 with equipment. Harley & Ellington, Inc., Stroh Building, is architect and engineer.

Sutherland Paper Co., Kalamazoo, Mich., has let general contract to O. F. Miller Co., Kalamazoo, for two-story addition to mill, 110 x 340 ft. Cost over $85,000 with equipment.

Cadillac Engineering & Mfg. Co., 1606 United Artists Building, Detroit, has been organized by Arthur W. Roehm, 5791 Somerset Avenue, and associates, to manufacture machinery and parts.

Gifford Engineering Co., Lansing, Mich., manufacturer of mechanical tubing, has taken over former plant of True Mfg. Co., Eaton Rapids, Mich., and will remodel for new plant. Present works will be removed to new location and capacity increased.

Banner Brewing Co., Saginaw, Mich., has plans for extensions and improvements, including additional equipment. Cost over $25,000. George B. Bright, 2615 Twelfth Street, Detroit, is engineer.

PACIFIC COAST

Wehle Brewing Co., West Haven, Conn., plans new brewery near Los Angeles, with power house, machine shop and other mechanical departments. Cost over $175,000 with equipment. A similar brewery is also being planned near San Francisco. Maurice M. Cohan is vice-president.

Bureau of Reclamation, Denver, asks bids until Jan. 24 for five 30-in. diameter sphere valves for connection to service station penstock, Boulder power plant, Boulder Canyon, California-Nevada-Arizona (Specification 610); until Jan. 28, three oil purifiers, each with capacity of 1200 gal.; one filter paper dryer and one test tube centrifugal oil tester for same power project (Specification 647-D). Until Jan. 28, 12 15-ft. 2-in. by 14-ft. bulkhead gates for turbine draft tubes, with lifting hooks, rollers, storage brackets, seals, etc.; two similar gates, 17 ft. 10 in. by 14 ft., and 11 ft. 4 in. by 14 ft. respectively for same power project (Specification 648-D).

Board of Education, Los Angeles, plans vocational training shop in connection with new group of buildings at San Pedro high school, 1221 South Gaffey Street, San Pedro district. Cost about $325,500 with equipment. Gordon B. Kaufmann, Union Bank Building, Los Angeles, is architect.

Constructing Quartermaster, Benton Field, Alameda, Cal., plans group of mechanical shops and other buildings at local air field, including main aircraft machine works for parts production, assembling and repairs on about 4 acre tract. Fund of about $2,750,000 will be arranged for project during 1935.

San Fernando Heights Orange Association, San Fernando, Cal., has plans for new one-story packing plant, 114 x 122 ft. Cost about $45,000 with conveying, loading and other mechanical-handling equipment. W. W. Ache, 1616 Fourth Avenue, Los Angeles, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 15 for one motor-driven planer and shaper, with spare parts (Schedule 4024) for Puget Sound Navy Yard; until Jan. 18, 12,000 doz. tungsten hacksaw blades (Schedule 4040), 12,050 lb. corrosion-resisting sheet steel (Schedule 4053), 46,440 ft. plow steel wire rope (Schedule 4041) for Mare Island Navy Yard.

FOREIGN

Coventry Gauge & Tool Co., Coventry, England, manufacturer of precision instruments, gages, tools, etc., has acquired tract of about 8 acres as site for new plant, consisting of several one-story units. Cost over $80,000 with equipment.

Electrical Supply Commission, Johannesburg, South Africa, asks bids until Jan. 29 for three watertube boilers with mechanical draft equipment, fuel-handling equipment, oil elimination equipment, feedwater heater, surge tanks, three pumps and accessories for electric power station.

East Manchurian Rayon Co., Ltd., Mukden, Manchuria, has secured concession from Manchukuo Government for new cellulose rayon plants at Kirin and Lungchingtsun, using neighboring timberlands for raw material supply. Each mill will comprise several units, with power house, machine shop and other mechanical departments, to cost over $500,000 with equipment.

H. J. Heinz Co., 1062 Progress Street, Pittsburgh, manufacturer of canned food products, is considering new branch plant at Melbourne, Australia. Cost over $350,000 with machinery.

NEW TRADE PUBLICATIONS

Refractory Fire Brick. — Laclede-Christy Clay Products Co., St. Louis. Bulletin, describes Laclede "Mullite" Fire Brick and pictures applications of its use. Four pages, 8½ in. by 11 in.

Tool Room Machine.—Pratt & Whitney Co., Keller Division, Hartford, Conn. Bulletin, describes and illustrates automatic tool room machine, its equipment and uses. Size, 8½ in. by 11 in., 12 pages.

Jacks, Pulling. — Pierce-Miller & Co., Brazil, Ind. Bulletin, illustrating wide applications. Capacity tables and charts. Size, 9 in. by 11 in., 4 pages.

Motors. — Louis Allis Co., Milwaukee. A wheel, arrow and windows device, 8 in. in diameter, for locating price and detail information on any motor manufactured by the company.

Metal Balers. — Logemann Brothers Co., Milwaukee. Four-page bulletins, No. 190-191, describing and illustrating triple-compression and ejecting type hydraulic metal balers.

Conveyor Elevators. — Stephens-Adamson Mfg. Co., Aurora, Ill. Catalog, 16 pages, continuous flow conveyors for conveying bulk materials horizontally, vertically, up inclines or around curves. Installations illustrated, pushers and agitators pictured and described, loaders, sections and dischargers detailed. Capacity charts and tables.

Compressors.—Chicago Pneumatic Tool Co., New York. Bulletin, No. 728, 8½ x 11 in., punched for binder. Sectional diagrams with arrows. Detailed descriptions of component parts, drives, control and regulation. Table of sizes and ratings.

Conveyors.—Mathews Conveyer Co., Ellwood City, Pa. Catalog, loose leaf, 72 pages, 8½ x 11 in. Diagrams, drawings, illustrations and tables covering standard and special equipment and installations. Roller conveyors, wheel conveyors, transfers, transfer shields and casters. Specifications and descriptions making available complete information.

Diesel Engines—Ingersoll-Rand, Phillipsburg, N. J. Descriptive 20-page bulletin, including eight page folder insert of sectional diagrams. Information for consulting engineers, illustrated installations, tables of ratings and dimensions.

Gas Engines. — Ingersoll-Rand, Phillipsburg, N. J. Descriptive bulletin, information for consulting engineers, illustrated installations, tables of ratings and dimensions; includes folder insert of sectional diagrams of Rathbun type engines for natural, refinery and manufactured gas fuels.

Turret Lathes.—Jones & Lamson Machine Co., Springfield, Vt. Descriptive of machines, machine units and equipment. Specification tables, tool dimension data, machine data sheets.

Worm Gear Reduction Units. — Cleveland Worm & Gear Co., Cleveland. Bulletin, 45 pages, indexed. Illustrations of units and component members. Complete tables and diagrams of dimensional information, illustrated applications, single and double reductions, diagrams and charts of bedplates. Data on Cleveland worms and gears.

Sheet Metal Shear. — Beverly Throatless Shear Co., 3009 West 110th Street, Chicago. Folder descriptive of small bench type throatless shear in 14 and 10 gage sizes.